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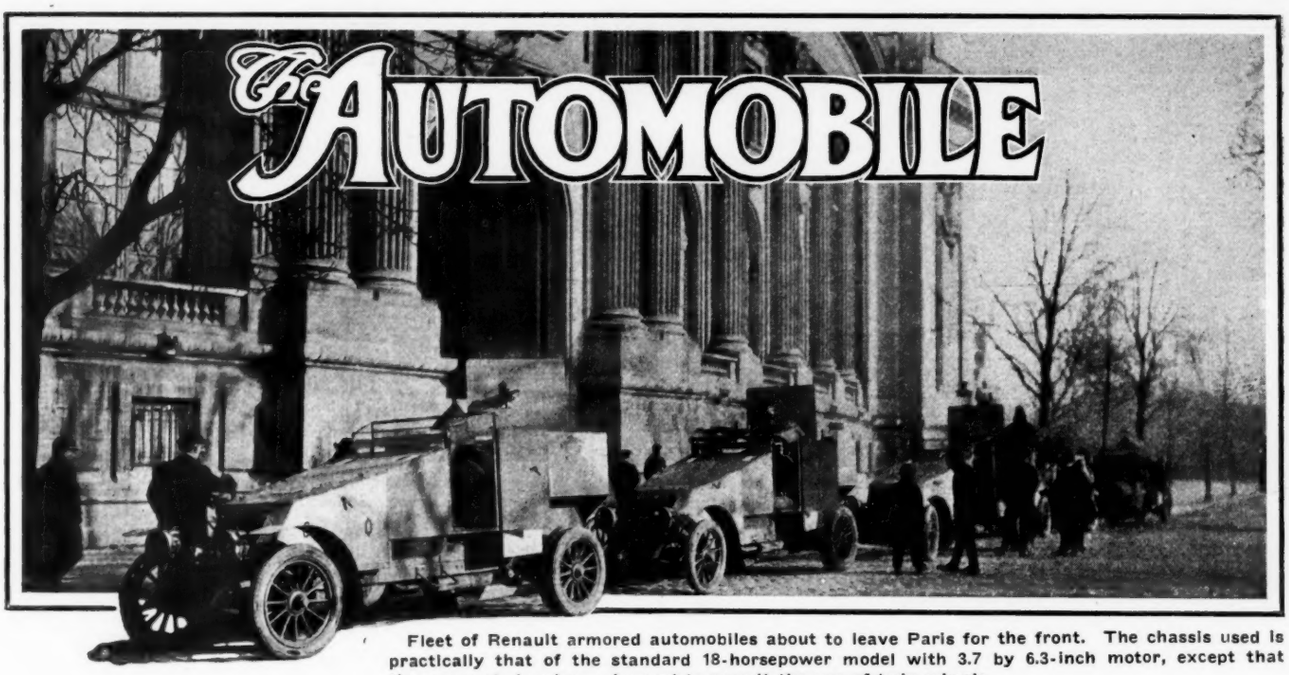


Fleet of Renault armored automobiles about to leave Paris for the front. The chassis used is practically that of the standard 18-horsepower model with 3.7 by 6.3-inch motor, except that the rear axle has been changed to permit the use of twin wheels

France Builds Armored Cars

Traveling Forts Prove Impractical Under Present Conditions —Light Weight Essential—Armored Touring Cars, 2-Ton Truck Chassis and Light Cars with Minimum Plating Do Best Work—Wheels Not Protectcd

By W. F. BRADLEY,
Special Representative of THE AUTOMOBILE *with the Allied Armies in France*

PARIS, Nov. 28—In common with many other French firms, the Renault company has received an important order for armored automobiles. The first series has just been delivered and has been taken over by the French naval brigade operating in Belgium along the coast line. The chassis is the firm's 18-horsepower model having a four-cylinder motor 3.7 by 6.3 inches bore and stroke. It is mounted on detachable wood wheels with pneumatic tires, twin wheels being used at the rear. With the exception of the change necessary in the rear axle to accommodate twin wheels, the chassis is practically standard.

Cars All Protected

Armor plating protects the whole of the car with the exception of the tires and wheels, which are left fully exposed. The method of construction is to place steel ribs at rather wide intervals from frame member to frame member, above the motor and as far to the rear as the steering wheel. Steel plates are attached to this framework by means of bolts and winged nuts. This makes it possible to quickly dismount any plate if it is necessary to examine the mechanism. The housing completely covers both the motor and the radiator, which is behind the power plant, as on all Renault cars.

As will be seen from the illustration the general shape of the Renault bonnet is maintained, but without the angles being rounded off. There is a gap in the forward portion of the housing to allow of air entering, the draft being assured by the flywheel fan. While this general arrangement might appear to be inefficient as regards cooling, it is worth noting that on the latest Renault models, intended to have been produced for the 1915 season, no radiator tubes are exposed, the sides and top of the bonnet being flush with the sides and top of the radiator. The capacity of this latter has

—Copyright by Underwood & Underwood.

Armored Autocars accompanying the Canadian troops at the time they were inspected by the King of England during his review of the forces at Bustard Camp, Salisbury Plain

been increased. While the cooling arrangements can hardly be considered ideal, they ought to be found sufficient for winter work.

A steel plate is carried in the extreme front, between the frame members, so as to protect the underpan, which with this system of cooling must be completely airtight so as to prevent the draft passing otherwise than through the radiator tubes. At the rear there is a similar plate, filling up the whole of the space between the frame members, and giving protection to the axle and differential housing.

Body Well Protected

The body is a box-like structure with a quick-firing gun pivoted in the center and having a rectangular shield. With the exception of a tool box under one of the overhanging panels on the left-hand side, the whole of the kit is under cover. The steering column is well raked so as to give the driver as low a position as possible. His protection consists of the scuttle dash, which consists of an inclined plane from the front of the motor to the steering wheel, where it is surmounted by steel louvres with a variable inclination. A complete set of spare tires is placed upright at the back of the driver's seat. No special seating accommodation is provided for the gunners. The crew of each car consists of three men.

Need for Armored Cars

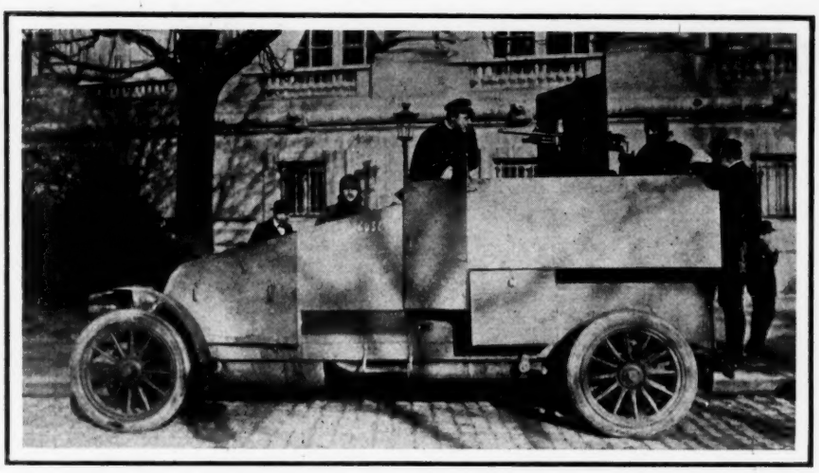
No type of automobile has proved more useful than the armored car. Yet it is this branch of automobile application to warfare which had received least attention before hostilities were declared, and on which the army authorities even now possess the least knowledge. Of all the powers engaged in this war, Germany alone seems to have appreciated the armored automobile; but she was the only power prepared for an offensive war. And even her machine had the disadvantage of having been developed in the drawing office, and not on the road. The other nations in the war adopted armored automobiles after the outbreak of hostilities, and when they had seen what Germany was doing.

French army automobilists at Clermont-en-Argonne, near the German frontier. The tall man on the right is M. Lacoste, director of the Hispano-Suiza company; next to him is Albert Guyot, the Delage racing driver, who recently had a narrow escape on the firing line

All Sorts of Cars Used

Every type of vehicle propelled by an internal combustion motor appears to have been thought suitable for receiving a gun and some armor plating. On the one hand we have the traveling German fortresses, standing 9 or 10 feet high, completely inclosed in steel, and probably weighing 8 or 9 tons, and on the other hand there are ordinary touring cars, taken out of private service and fitted with a quick-firing gun back of the rear seat, without an inch of protective plating. The German traveling fortresses might have been useful if the high road march to Paris had been carried out during the month of August, according to schedule. It is difficult to conceive of them making any progress on the secondary roads which have been cut up by 3 months' war, heavy rains, and some frost. The French touring cars with a gun in the rear might have been useful against savage tribes.

Armored cars generally have suffered by reason of their method of design. The artillery services have ordered or taken possession of a certain type of standard chassis, have put a gun on it and put plating around it without paying sufficient attention to the design as a whole. Weight is the enemy. Obviously it is a difficult matter to maintain a low weight if steel plating of adequate thickness has to be carried round men, gun and mechanical organs to make them proof against rifle bullets and shrapnel.



Renault armored automobile manned by French marines. The first series of these cars has just been delivered and taken over by the French naval brigade operating in Belgium. The chassis used is that of the 18-horsepower Renault model, the only change being the alteration of the rear axle to permit mounting dual tires

Two Types of Armored Cars

The extreme type, or traveling fortress is not suitable for warfare under the conditions pertaining at the present time. It must have first-class granite or macadam roads, and even in highly-developed Europe these are not always available. Results up to date show that two distinct types of armored automobile should be provided for. The first is a powerful touring car, or even a 2-ton truck chassis, completely incased, but without losing sight of the fact that weight must be kept down. The Belgians have some very good examples of this type of armored car. They have taken their more powerful touring car chassis, with motors approximately 4 by 6 inches bore and stroke and have built a suitable steel body on them. These machines are not intended to do cross-country work, but they will naturally have to operate on dirt roads and should have a reasonable clearance. In order to keep weight at a reasonable figure, the height should be as low as possible. It is quite possible to give all the protection required for the men and gun without exceeding a total height of 60 inches. The steering column is well inclined so as to bring the driver towards the center of the car, and in as low a position as possible. There is no difficulty regarding the seating accommodation, for the interior of the body is a single compartment. A roof is not required; while it is dispensed with on most of the cars now in the field, it is considered to be advantageous to have a partial roof, the center being open for the manipulation of the gun. Many of the Belgian machines have a turret revolving with the gun.

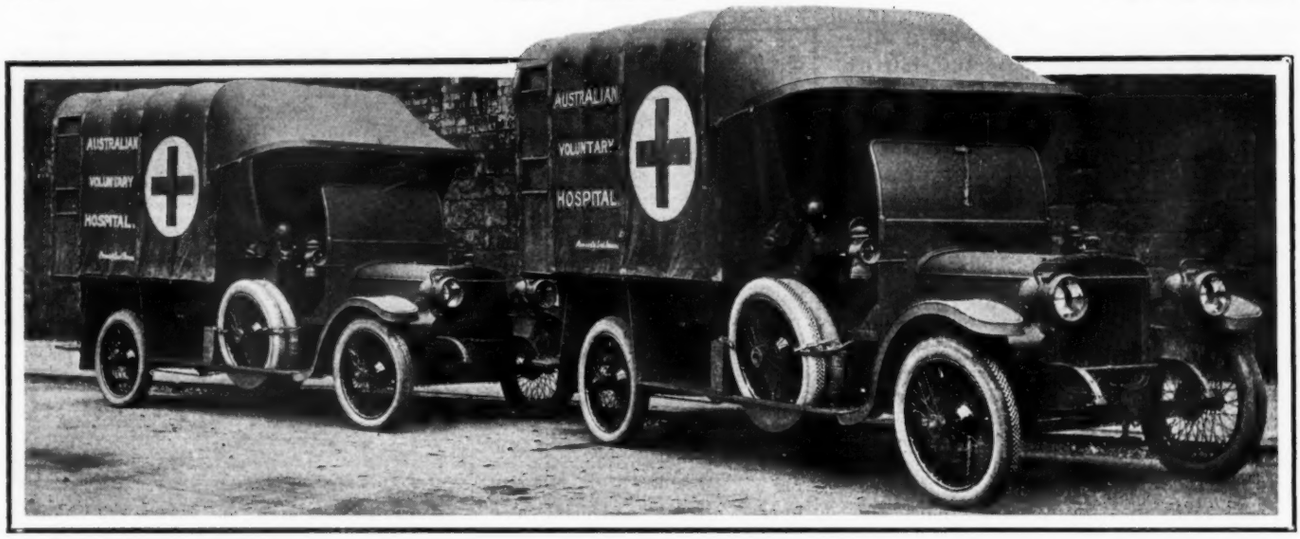
Protecting the Radiator

The motor and radiator must be completely protected. It has been proved that it is possible to do this without interfering with the cooling efficiency. With a correctly designed fan and a slightly larger radiator, enough air can be drawn in to keep the motor cool under the most disadvantageous circumstances. In most cases the bonnet is of such a design that it allows of the easy escape of the hot air under it without allowing shot to enter.

There is no necessity whatever to completely inclose the wheels, indeed to do so makes the car useless except on perfect roads, yet some protection should be provided. Detachable wheels are an absolute necessity. For war purposes wire detachable types have proved their superiority. On the heavier armored machines cast steel wheels are proving satisfactory.

A differential lock is proving to be a valuable

French army drivers preparing their dinner in a village near the firing line. The second man to the left of the water pipe is Albert Guyot, the Delage racing driver who drove in the Indianapolis race last May



Two 20-horsepower Daimler ambulance vans presented by Lord Furness to the Australian forces sent to the battle front in France

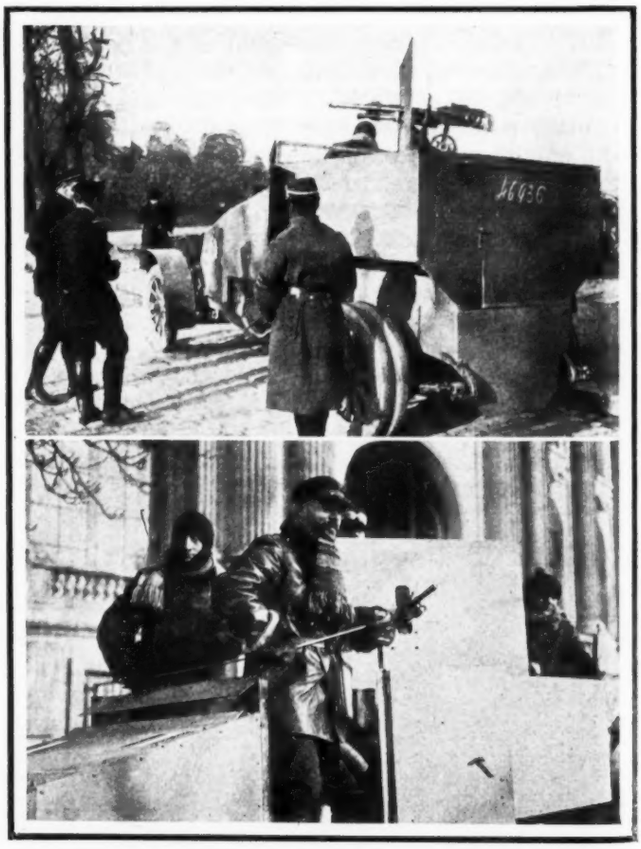
auxiliary. It is an obligatory fitting on certain types of French army tractors. The driver of an armored car soon asks for chains for his driving wheels, although he may never have used them in private service. Among the truck types which are being used as armored cars are the London omnibus chassis and French 2-ton trucks. While they are satisfactory as a whole, the bus chassis are unnecessarily big for carrying a single gun and three or four men. Their bulk is further increased by building the body with an overhang, so that it protects the wheels.

Light Armored Cars

The second type of armored automobile is the light car of the Ford class, with the minimum amount of plating. It is known that the French authorities have had a number of Fords under practical test, and it is quite possible that the order for them will have been placed before this story appears in print. These machines are intended to operate over any kind of road and to do a certain amount of cross-country work. The object of these cars is to extend the scope of the machine guns attached to cavalry and infantry regiments. The men who handle these guns carry them over every kind of country, and if the same work is to be done by an automobile, but of course with greater rapidity, ability to pass everywhere must be the main consideration. There cannot of necessity be much plating; protection of the main organs against rifle fire is the utmost that can be expected. Even this is not absolutely necessary. The machine gun sections make their way without any artificial protection, and the men who handle these cars will not run exceptional risks by doing the same.

Four-Wheel-Drive Suitable

Evidently there has been no time to produce the ideal armored automobile. It may be that plans are in hand, but if so, it will not be known until the completed machine has made its appearance. The four-wheel-drive has already proved its value and should be adapted to armored automobiles. A machine similar to the light four-wheel-drive tractors, of which the French are now making considerable numbers, would be ideal for this work. The present machine, however, is unnecessarily heavy, for it is designed to pull a useful load of about 6 tons. With the same design, however, and much lighter construction, an excellent fighting machine would be obtained. All on it need not weigh more than 3 tons.



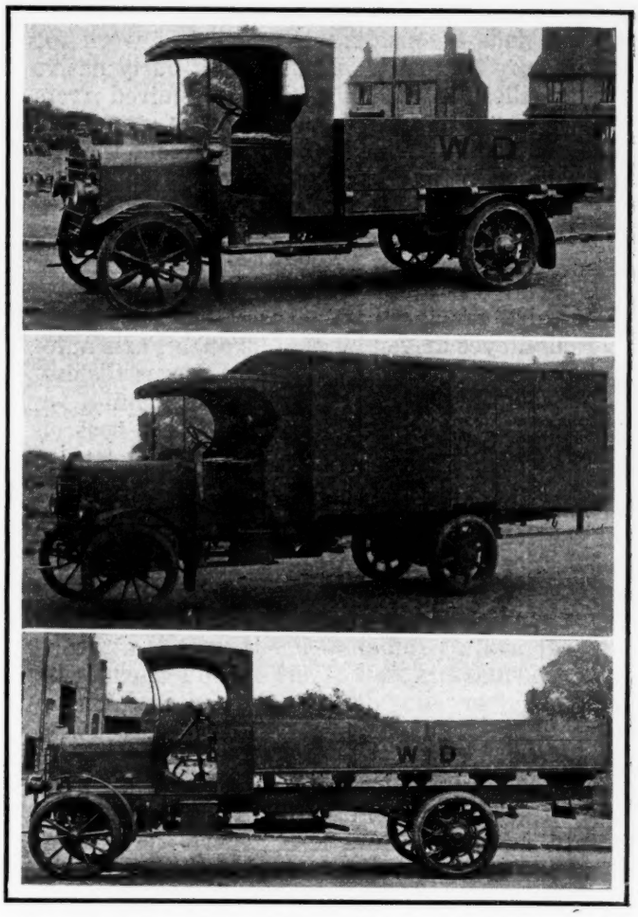
Upper—Another view of one of the new Renault armored cars, showing the mounting of the machine gun behind the armor plate
Lower—French naval officers in one of the armored cars built by the Renault company for service with the naval brigade on the coast of Belgium

Such a machine, driven and steered at both ends, could have a speed of 30 to 34 miles an hour, which is ample for war requirements, and would be capable of traveling over any country on which a horse can draw a load. In addition to driving at both ends, it should have duplicate steering, so that the driver has only to turn from one wheel to another to travel stern first. Instead of the six forward speeds now used on these light tractors, there should be four forward and two reverse speeds. This will enable the machine to travel ahead at a rapid pace and will enable it to get out of difficulties from which it would otherwise be inextricable.

It is somewhat surprising that a vehicle of this type has not been already produced. Events have moved with greater rapidity than designers. The four-wheel vehicle has only just been perfected, but the French, who are responsible for the pioneer work in Europe, have not got any further than its application to heavy loads. The double-steering car, with a low and a high reverse, has also been in use for some time, but only for the purposes of smuggling along the Franco-Belgian frontier.

Cars for Big Guns

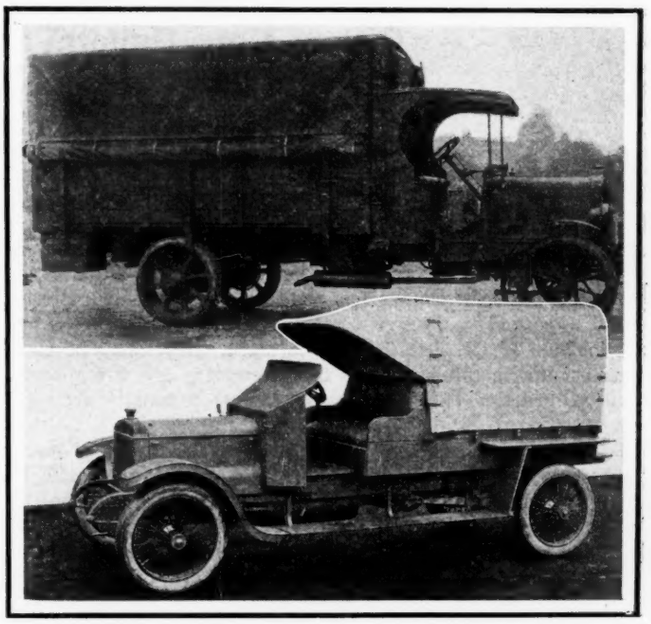
There are other applications of the armored automobile to artillery, but they do not come under the category of armored cars. The French, for instance, have some of their heavy guns mounted on special automobile chassis fitted with four solid struts capable of lifting the wheels clear, thus providing a solid platform. Further, many of the 155-millimeter guns are drawn by four-wheel-drive tractors instead of by horses. These, however, are only successful attempts to give greater mobility to artillery than is possible with the use of horses. There is no attempt at armor plating the vehicles. When the tractors have brought the guns into position they are put into a place of shelter in just the same way as horses. They are more easily concealed, however, than animals, and by means of their winches they have the advantage of being able to haul the guns out of a difficult position without actually exposing themselves.



Upper—A Daimler 2-ton truck supplied to the British war department fitted with open box body. Note the simple and solid construction

Middle—A Daimler 3-ton type fitted up as a traveling stores. This vehicle carries a full complement of parts for a 3-ton Daimler

Lower—One of the numerous 4-ton Daimlers now in service with the British army



Upper—The Daimler traveling workshop ready for the road. This carries a complete outfit for making repairs of all kinds

Lower—A 20-horsepower Daimler equipped with canopy top and shield for the driver. Note the shelf-type rear fenders

President of France Rides in German Car

PARIS, Nov. 27—President Poincaré left Paris this morning for his third visit to the troops in the firing line. As on the two previous occasions the French president traveled by automobile; indeed, Poincaré is such an enthusiastic motorist that he would not consent to any other means of locomotion. There is an entire absence of ceremony in these trips. The cortège consists of four automobiles. In the first is the director of the secret detective service and a couple of his assistants. He is followed by the president, riding on this occasion in a 70-horsepower Benz touring car—much to the displeasure of the ardent patriots aware of this fact. The presidential car is driven

by M. Romano, a well known French race driver who has done a considerable amount of work for the Gregoire company. Romano is a burly native of Marseilles, in which port he acquired from American sailors such a knowledge of American slang and such a refined American accent that he can easily pass for a citizen of the United States. Two officers of the presidential staff ride with Poincaré.

Non-Stop Runs Sure

The third car carries staff officers. The fourth is a Rolls-Royce driven by M. Journu, a Paris automobile salesman, accompanied by Georges Sizaire. The official function of Sizaire is presidential repairman. He has been selected for this post on account of his complete knowledge of automobiles, which enables him to discover the cause of a stoppage in less time than most men take to think about it. It should be mentioned, however, that Sizaire prides himself on the fact that the cars never have to stop on the road; at the end of each journey he gives them his personal attention and is certain of them making a non-stop run.

Preparations for the presidential visits to the army are kept secret; it is not until they are actually on the road that the drivers are given instructions as to direction. A fast pace is always maintained, the detectives' car running a certain distance ahead to warn sentinels of the approach of the president. These precautions are necessary in order to avoid attentions from hostile aeroplanes.

PARIS, Nov. 28—News has been received from the front of Albert Guyot, one of the leading French race drivers, who will be remembered as a competitor for Delage in the last Indianapolis 500-mile race and the driver of a Sunbeam in the 1913 speed carnival at Indianapolis. Guyot is attached to the headquarters staff of one of the French army corps in the Argonne district, close to the German frontier. He is a member of the motor corps, with the rank of sergeant.

After having been in hospital a few days with a slight attack of dysentery, Guyot recovered and resumed duties. There is a general impression among those who have not been at the front that the men in the motor corps run less danger and display less bravery than those occupying the trenches or fighting in the open. In this connection Guyot mentions that persons holding this view should pay a visit to the firing line. "Only yesterday," he writes, "we lost 500 men in half an hour in what was considered a very successful attack on the enemy's lines. Two men who were with me were killed outright. I can only suppose that it is my luck which brought me through without a scratch.

"We realize that it is going to be a long job, and that it will be months before we get back to racing cars again—if ever we do get back. But we have plenty of determination and plenty of patience, and in the end we shall win all along the line."

Defends Battery-Coil Ignition

Claims More Uniform Spark, Better Acceleration and More Power Are Obtained at Slow Speeds

By H. E. Rice
Atwater Kent Mfg. Works

PHILADELPHIA, PA.—Editor THE AUTOMOBILE:—While it is far from the writer's wish to place the question of magneto vs. battery ignition on a controversial basis, he cannot feel that Dr. Cunningham's letter which appeared in THE AUTOMOBILE issue of December 3 is conclusive. If Dr. Cunningham is right, then many of the foremost automobile engineers in the country are wrong and ignition practice is sliding backward at a most startling rate.

Before making comment in detail upon Dr. Cunningham's statements, it might be well to reflect that every radical change in automobile engineering or other fields generally passes through varying changes of ridicule, skepticism and prejudice, especially when such a change is of considerable commercial or economic significance. It is surely true, however, that if the change or development in question is a beneficial one, it ultimately wins its own battle on merit despite antagonism and negative criticism.

For several years the so-called high-tension magneto was generally used for ignition purposes. There can be no question that it served efficiently within its natural limitations, but about 2 years ago, coincident with the rapid development in electric lighting and starting equipment, the movement toward battery ignition (retrogressive according to Dr. Cunningham) set in and at the present time over 50 per cent. of all cars costing from $500 to $2,500 have retrogressed (?) so far as to adopt it. Some have used it for several seasons and are apparently content to keep right on retrogressing with outputs which have increased yearly.

Let us consider the statements for which Dr. Cunningham is authority. First he questions: "Why the magneto"? Why, indeed!

Why should it be necessary for a car to carry a special little generator or magneto which generates a current for ignition purposes only and in the reverse order to which it is required, when we already have on the car a generator and battery which constitute a dependable source of current, having the best possible characteristics for ignition requirements?

In a well-designed ignition equipment the spark should be

uniform throughout the entire speed range of the motor. The spark should be at least as hot and dependable on the first half turn of the starting motor as when the car is running at 40 miles per hour.

Its inability to furnish an adequate spark at very low speeds is of course the chief limitation of the magneto. Its spark heat at 40 to 60 r.p.m., ordinary cranking speeds, is very low, if indeed, it will furnish a spark at all. Even at 100 to 150 r.p.m., the magneto is not likely to furnish a spark sufficient for positive starting unless it is quite new and in the pink of condition.

When it is considered that in cold weather with a cold motor, the speed at which the average starting equipment will spin the motor is considerably less than the minimum speed at which the magneto will generate a dependable spark, one of the biggest reasons for the widespread adoption of battery ignition will be obvious.

Battery Best to Accelerate

In addition to the advantage of easy starting, any car equipped with battery ignition will throttle down and idle at a very much lower speed, with better accelerating qualities.

The only fair basis of comparison between battery and magneto ignition is to consider a magneto of the dual type in which a battery is used for starting and the current generated from the magneto for running.

Most of the manufacturers who have retained the magneto are using this dual type, which is at least as complicated as to circuits and mechanism as any standard battery ignition system. As opposed to the dual magneto system; a simple, standard battery ignition system is more simple, has fewer parts and less wiring, is more effective and is at least as dependable. It is also considerably less expensive in first cost and maintenance.

With reference to battery reliability, the amount of energy required by a properly designed battery ignition system is so small as to be negligible; with the result that if the battery is so far exhausted that the cranking motor will not crank, lights will burn down to a dim red and even the electric horn will refuse to respond, yet there will be sufficient energy to furnish ignition for many hundreds of miles and a normal hot starting spark will be available at the first quarter turn of the crank.

Many of the criticisms occasionally directed against the starting motor and battery are the direct result of undependable ignition at cranking speeds. The starting motor and battery are called upon to deliver a large amount of energy in proportion to their normal capacity for brief periods of time. It therefore makes a big difference in mechanical strain and wasted energy whether the engine starts on the first or second turn or only after 10 to 15 seconds of churning.

Regardless of the question of gas ionization and the relative speed of flame propagation from different kinds of spark, the magneto unquestionably gives a hot spark at normal speeds, and, therefore, ignition efficiency; also at high speeds the magneto produces a much hotter spark than in direct proportion—in fact, if the magneto is built and adjusted to give a sufficiently hot spark at very low speeds, it will be so hot at high speeds as to damage the plugs or contact points in the course of a short time.

Battery Spark Amply Hot

It is the contention of the manufacturers of the one or two standard battery ignition systems which have been widely adopted, that the spark produced by these systems is amply hot to do the work at all speeds, and as a matter of fact, no magneto has been able to show any increase in efficiency from either standpoint of power produced or gasoline consumed than a battery ignition system of the type now being used by many of our foremost car manufacturers.

As a matter of fact, a properly designed modern ignition equipment provided with automatic spark control will show an increase in power, flexibility, acceleration and gasoline economy over any magneto. Many manufacturers will testify to this fact.

Dr. Cunningham is in error relative to the necessity for constant spark lever manipulation required in order to use battery ignition properly. He has overlooked the very successful use of the automatic spark advance feature now coming into widespread use.

The results obtained by some of the car manufacturers using this device led them to discard altogether the use of the spark lever. The automatic spark advance also affords a factor of increased safety by automatically retarding the spark for starting. It contributes to the pleasure and ease of handling the car by leaving the timing of the spark entirely to the automatic feature.

For anything like equal efficiency a magneto equipped car requires not only a spark control lever, but its intelligent handling.

Battery System Simpler

The writer feels that Dr. Cunningham errs in intimating that the reliability and lasting qualities of a properly designed battery ignition device are not equal to those of a magneto. There is less mechanism and far less mechanical energy involved in a properly designed battery system than in a magneto, also the speed of the former is but one-half that of the latter, thus saving somewhat in bearing wear. The battery system may be installed in a far simpler and less expensive manner than the magneto, and if its installation is attended with a tenth of the thought and care usually given to the installation of a magneto, it will last as long as any other part of the motor.

With reference to the canvass made by Dr. Cunningham among chauffeurs driving cars equipped with battery ignition, no comment is necessary other than to express a sincere conviction that the men questioned did not represent a fair average of the sentiment which is, without question, rapidly growing in favor of battery ignition.

If Dr. Cunningham could have extended his inquiry to sales managers, engineers and superintendents of several of the larger car manufacturers who have successfully used battery ignition for the past two or three seasons, together with some 300,000 pleased owners of cars equipped with ignition of this type, he would possibly have led the readers of his communication to a more accurate conclusion.—H. E. RICE, Atwater Kent Mfg. Works.

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90 Per Cent. Aluminum in Piston

An aluminum piston made in Belgium has been analyzed for *The Autocar* and shows that an ordinary alloy of this metal can give good results for piston work. The analysis is as follows:

Copper	6.8 per cent.
Zinc	2.44 per cent.
Iron	0.14 per cent.
Silicon	0.22 per cent.
Aluminum	90.40 per cent.

The specific gravity of the sample is 2.87.

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93% of Kansas Cars Owned by Farmers

TOPEKA, KAN., Dec. 11—Checking the list of new automobile licenses shows that 93 per cent. of the cars in this state are bought by farmers. Those who have sold their wheat are buying cars and those who have not sold their wheat are giving chattel mortgages on their crops to buy cars. Thus far in the fiscal year 47,200 automobiles and motor trucks have been licensed in this state. There are several hundred of the commercial vehicles, but the bulk of the registrations are of family touring cars. Automobile licenses are being recorded at the rate of nearly 100 a day, continuing the average struck during September and October.

Measuring Efficiency Correctly

Promptly Detailed Information of What Is Done Each Day Compared to What Has Been Done and What Can Be Done Is Best Method —The Two Great Fallacies in Gauging Results

By H. L. Gantt

¶Editor's Note—The following article is a digest of a paper prepared by H. L. Gantt for presentation before the annual meeting of the American Society of Mechanical Engineers held in the Engineering Societies' Building, New York City, December 1-4.

TO the engineer the word "efficiency" has a definite meaning, which may be expressed approximately as the ratio of the useful result produced to the effort utilized in producing it. To the public in general it means simply doing things better.

It is very unfortunate that the term "efficiency engineer" was ever invented, for every engineer is engaged in the work of promoting efficiency, and it seems presumptuous for any class of engineers to arrogate to themselves a title which implies that they are preeminently promoters of efficiency. A more correct appellation would be "management" or "industrial" engineers.

Waiving the subject of name, however, it is certainly a fact that the agitation of the subjects of management and efficiency during the past few years has caused many employers to study their management problems very much more closely than heretofore, with the result that there has undoubtedly been a marked improvement in the efficiency with which industrial operations as a whole are being conducted.

So far so good. But in spite of this increase in efficiency, the greatest of our industrial problems, the relation between the employer and the employee, seems but little nearer solution. While there has been a distinct improvement in isolated cases, these cases are few compared with the total number.

Widening the Gap

It is safe to say then, that the promotion of efficiency is not alone sufficient to serve the needs of a nation that aspires to be a leader in industrialism. As a matter of fact one of the most efficiently run plants I have ever seen promises, unless my theories are all wrong, to widen the gap between employer and employee. The solution lies deeper, and before we can make any real progress toward it, we must revise some of our fundamental conceptions.

The present system of railroad accounting had been developed, and certain ratios accepted as measures of efficiency of operation; notably among them the ratio of operating expense to total income.

Being accustomed to having the managerial efficiency of railroads expressed by a simple ratio, the financier demanded a similar simple measure of the efficiency for an industrial plant. The cost accountant promptly gave him what he called the ratio of "non-productive" to "productive" labor, which he said should be low for good management. By "non-productive" labor he meant salaries of all kinds, and all other labor that could not be charged directly to an order, including miscellaneous labor such as watchmen, sweepers, truckmen, etc. By "productive" labor was meant simply that labor which could be charged directly to an order.

While the ratio of operating expense to total income may be a fair measure of efficiency in a transportation company, the ratio of "non-productive" to "productive" labor is not only not a fair measure of the efficiency of operation in a manufacturing plant, but is often exactly the reverse.

The Two Fallacies

To my mind the widespread use of this ratio as a measure of efficiency, has been more effective in producing inefficiency than any other single factor, except the oft-repeated statement that you must have low wages if you would have low costs. Until these two fallacies are absolutely discredited, we cannot expect a solution of our most serious problems.

Of these two fallacies, the second, namely, that you cannot have high wages and low costs, seems to be yielding gradually to the overwhelming mass of evidence against it. So many cases are now on record where the industrial engineer has increased output, raised wages, and at the same time lowered costs, that only those who are too conservative to investigate are still holding on to the old theory. Better still, many employers have shown the courage of their convictions by adopting a scheme of management for the increase of output and the reduction of costs, which they are perfectly well aware will make a decided increase in wages. With evidence of this kind at hand, it is safe to say that this fallacy will before long be entirely discredited. On the other hand it must be fully understood that something more than a simple increase in wages is necessary to increase output, and if nothing is done but to increase wages we are sure to get higher costs.

The other fallacy, that the ratio of "non-productive" to "productive" labor is a gauge of efficiency, is so firmly rooted, however, that it is hardly to be expected that it will yield in the near future.

In considering this subject I wish to call attention first to the terms "productive" and "non-productive" labor, which seem to me to be misleading. If any expense is "non-productive," namely, does not contribute to the end for which the factory was established, it should be eliminated. The salaries of the officers, foremen, janitors, truckmen, and laborers, as well as the money paid for taxes, insurance, or interest are necessary to the operation of the factory and therefore productive. They are, however, not chargeable usually to any specific order, but must be distributed over all the work done according to some definite rule. I prefer to call all such expenses that have to be distributed "indirect" expenses, and those that are chargeable to specific orders "direct" expenses. The ratio which we have in mind is thus more correctly described as that of "indirect" to "direct" labor. This, however, is a matter of names and does not affect the fact that to base any conclusions as to the efficiency with which factory is run on this ratio is misleading, and to attempt to use it as the gauge in operating a factory may be, and often is, productive of inefficiency rather than efficiency.

This fact can best be made clear by a series of examples. In a factory where this ratio was used as a guide the following incident occurred:

A foreman had ten men on a job, which he said could be done by eight if he could have a boy to supply them with work. He said, however, that if he

made the change, the boy's wages would be called "non-productive" labor and his ratio would go up, with the result that he would be criticised, so he did not make it.

In the U. S. Navy an energetic officer studied the loading of ammunition and very much reduced the direct labor employed, but, being unable to reduce the indirect labor in the same proportion, the above ratio went up. He came in for very severe criticism, notwithstanding the fact that his total labor had been decidedly reduced.

I might give numerous examples of this kind, including one where two men took the place of sixteen, and a daily direct wage of $8 took the place of $48, with but little increase of the corresponding indirect expense. The result of this and other changes was that the ratio for that shop became over double its former value, with a marked reduction in the total cost. Needless to say, that the ratio theory in that plan is not regarded wih the same reverence that it once was. In plants where such results have been accomplished, those who have been accustomed to worshipping this ratio, at once demand another idol in place of the one that has been so badly discredited.

The Shattered Idol

Inasmuch, however, as the efficiency of the operation of a factory is made up of the efficiency of a great many independent operations, and is really indicated only by the cost of the various articles produced, there has not yet been found any easy way of indicating the efficiency without first getting the cost of the individual articles. Hence there is no readily available idol that can be substituted for the discredited one. Having been accustomed to an idol, however, both the accountant and the financier demand one, and are loath to give up the idol they have so long worshipped no matter how badly shattered it may be.

Detail Knowledge Essential

In speaking of the cost systems, we must discriminate between cost systems and expense systems. Before we can get correct costs we must have a correct knowledge in detail of all the expenses of a plant, and some idea of how to combine these to get costs.

In discussing this subject, I wish to avoid the controversy as to the proper method of distribution of indirect labor and indirect expense and to confine myself to the problem of how to get a true knowledge of the various items of labor and expense, both direct and indirect. This subject seems to have been given but scant consideration by the average accountant, who has usually assumed this to be easy and devoted his energies to working out elaborate theories as to what should be done with the various items of expense. Inasmuch as I find that the information which the office gets of what the shop has done is, as a rule, not very reliable, I feel that it is far more important to get this information correct than to get up elaborate schemes for using it.

Everybody is agreed that all expense of material or labor that can be readily charged to an order should be so charged, but whether the indirect labor and expense should be charged in proportion to direct labor or machine hours, and how other items of rent, taxes, insurance, etc., should be distributed, are questions which it seems to me should be largely determined in each case on its merits. I have never yet seen any general scheme that seemed to suit all cases.

A Reliable Cost System

We shall therefore confine ourselves to the consideration of what the essential elements of a reliable cost system are, and how to get an exact knowledge of them. These elements are a knowledge each day of

(a) What was done the day before.
(b) Who did it, and
(c) What was paid for it.

It is necessary to check these items daily, for it is impossible to check them accurately after the lapse of any appreciable time.

It is comparatively easy to get a set of returns purporting to give the above information, but the real difficulty comes in knowing whether these returns are correct or not. The only sure way of knowing whether these returns are correct or not is to know beforehand

(a) what should be done the next day
(b) who should do it, and
(c) what should be paid for it.

When we have arrived at a condition under which we can plan our work in advance on these lines, we have the basis of a real system of management, in which we can promptly check what has been done with what should have been done, and know with certainty each day how we stand.

When it is realized that the installation of such a system seldom results in an increase of output of less than 25 per cent., and often as much as 100 per cent., it is easy to see that the additional clerical work cuts but little figure. As a matter of fact *the clerical work needed to operate the best systems of this type is decidedly less than that needed to operate any of the standard cost systems put in by chartered accountants.*

It must be borne in mind, however, that during the process of installing the new system and training the employees to operate under it, the old system must be continued; and not until each function performed by the old has been taken over by the new can we drop the old entirely.

During the process of installation, therefore, we must to a large extent operate two systems. This necessarily runs up the ratio of "non-productive" to "productive" expenses, and the accountant lifts up his hands in horror at the expense the new system is running them into. If at the same time the new system is successful in reducing the "productive" labor, the ratio is still higher, and the "showing" is still worse, even though the total cost is less. I therefore repeat that the first step to be taken before introducing a modern system of management is to eliminate the ratio of "non-productive" to "productive" labor as a measure of efficiency.

The elimination of this ratio as a measure, and the establishment of the fact that total cost is the only reliable guide, will do much to pave the way for an improved system of management.

Its Functions

The first step is to revise our ideas as to the functions of a cost system. In the past the principal function of a cost system, besides indicating a limiting selling price, has been to enable those in financial control to criticise those operating the factory. These criticisms are usually from one to three months late, and are so general in their character as to afford, as a rule, no guide whatever by which the superintendent can be governed. Such a system is too often most highly prized for its worst defect, namely, that it enables those in financial authority to criticise without taking any responsibility whatever for showing how to do better.

If, instead of making the function just described the prime one, we raise to equality with it a function which requires the system to furnish promptly, day by day if necessary, exact information of what has been done and what the expenditure has been, we shall find that its most valuable function becomes, not finding costs, but furnishing the superintendent with information which helps him to reduce costs.

The Cost Accountant

In other words, before we can expect to get any great benefits from the newer managerial ideas, we must readjust our ideas of the functions of the cost accountant, *who must become the servant of the operating executive as well as of the financial executive.*

As long as the cost accountant is simply a critic, he may be called "non-productive," but when he furnishes the superintendent with prompt information which enables him to reduce costs he becomes "productive." Promptly detailed information of what is being done each day, furnished in such manner as to be readily compared with what has been done, and what can be done, is the best method of measuring efficiency.

Gray & Davis Variable-Speed Generator

New Method of Voltage Regulation—Change in Shape of Machines—Instruments Lighter—Refined in Detail—Two Motors and Two Generators in Line—All of 6-Volt Type

TWO starting motors and two lighting generators with many new features will constitute the Gray & Davis line for 1915. The most important change is that found in the lighting generators which are now of the variable speed type. Both generators and motors have been reduced in size, the accessibility improved and detail mechanical and electrical changes made in both systems.

The two types of lighting generators are the T rated to give a current output of 10 amperes at 6.5 volts and 1,000 revolutions per minute and the S which gives 10 amperes at 6.5 volts and 650 revolutions per minute.

The two starting motors are the Y and the H-1, the former being new.

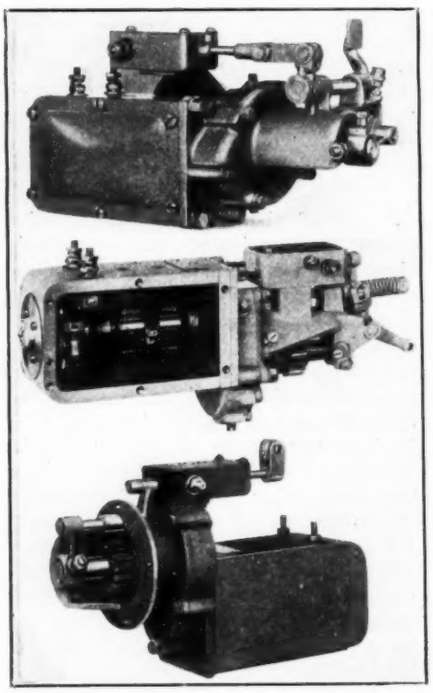
Most important of the changes in the generator is the method of voltage regulation. In the machines of this year voltage regulation was accomplished by maintaining the speed of the armature constant by the use of a centrifugal governor. In the new machine there is a combined regulator and cutout which rests on the top of the generator and which not only maintains the voltage constant regardless of speed variation but also breaks the circuit when the speed of the generator drops so low that the voltage it generates is less than that of the battery.

Rectangular Frame

The new machines have a rectangular or magnet-shaped frame which is constructed of one flat piece of low carbon steel formed into a U shape. This change in frame construction gives greater ruggedness, is more compact, allows more accurate alignment of the bearings and the number of parts is materially reduced. Magnetic leakage is also avoided.

The type T generator gives a 6.5-volt, 10-ampere current at 1,000 revolutions per minute, is intended for four-cylinder cars and is designed to run at approximately two and one-half times crankshaft speed, or in short, to be driven at its rated speed at a car speed of about 10 miles per hour car on high gear.

The type S generator is for six-cylinder machines and is to be driven directly from the magneto shaft, at one and one-half crankshaft speed. This gearing allows the generator to run at its rated speed of 650 revolutions per minute when the car is driven 10 to 12 miles per hour.



Upper—Y motor designed for open flywheel installation. The starting switch is on top. Middle—Y motor for open flywheel installation but with starting box at one side Lower—Y motor enclosed flywheel type

The generators for 1915 are similar in appearance to the type Y starting motor, being of the longitudinal yoke design. This construction has enabled the production of the same current at the same speed as heretofore but with a smaller and lighter machine.

The type T generator complete with regulator cutout weighs 20.5 pounds, a reduction of 6.5 pounds. It measures 4.13 by 5.34 by 8.62 inches, while the G-1 generator which it replaces measures 5.5 by 6 by 11.67 inches.

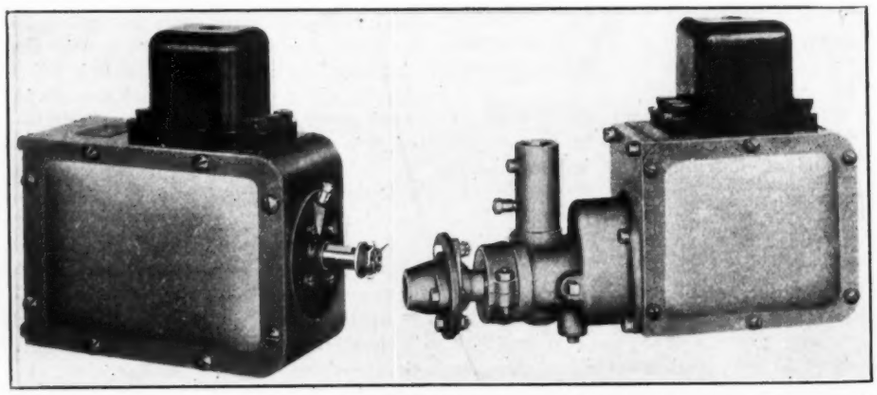
Likewise the new type S generator which takes the place of the type E has been reduced 1.25 pounds in weight and the dimensions reduced from 5.5 by 6 by 12.5, to 4.63 by 5.97 by 10.75 inches.

The type Y starting motor will be standard equipment for all except the largest cars. This motor is a new design and is rated at 6 volts, 100 amperes at 2,800 revolutions per minute. Cars with motors of extreme size will use the type H-1 motor, which was a standard model this year. It carries its full load when operating at 1,500 revolutions per minute, at which time it draws a current of 150 amperes. It operates only on the 6-volt circuit.

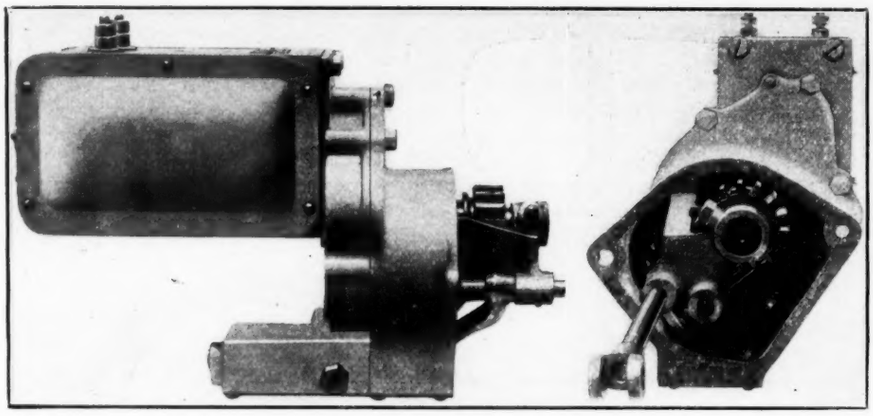
Accessibility Improved

Mechanical improvements in the starting motor have been directly chiefly towards accessibility and ease of inspection of parts and to the refinement of details to give greater strength. For accessibility, the new Y motor has the longitudinal type of field yokes which readily permits access to the interior of the motor by the removal of the cover plate from the side. The entire interior mechanism of the motor can be reached by removing these side cover plates by taking out six screws.

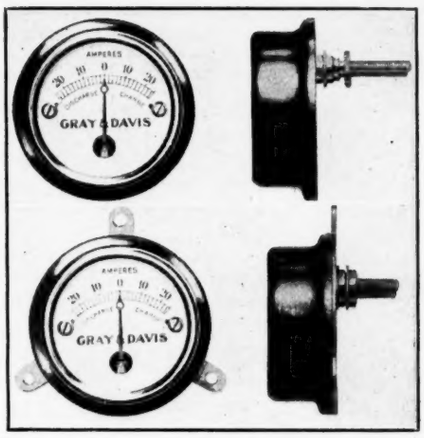
Electrical improvements in the Y motor have given it better torque than the type K motor of this year and it



Left—Model S generator with regulator cutout placed on the top. Right—Same dynamo with geared head and vertical ignition drive



Two views of Y motor enclosed flywheel type with side mounting of the switch. The driving gear construction is shown in the end view



Ammeters of the stud and case supported type

weighs only two-thirds as much, the new motor weighing 19.75 pounds and the old one 31 pounds. While the type K motor was rated to develop normal load at 3,600 revolutions per minute with a current draw of 100 amperes, the type Y develops the same torque with the same current consumption at 2,800 revolutions per minute. The type Y motor is 4.312 by 4.72 by 8.16 inches. These dimensions compare favorably with the K motor which was 5.75 inches in diameter and 8.875 inches long.

For 1915 the flywheel drive will be standard. The speed reducing gears and starting switches are integral with the motor casing and arranged so that a single movement of the starting pedal simultaneously meshes the sliding pinion with the flywheel gear and closes the starting switch.

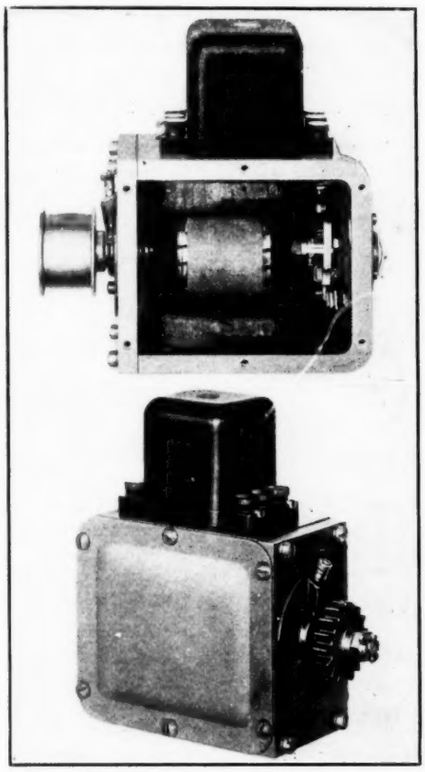
Cranking Speeds

Cranking speeds vary according to the motor but the following table showing the speeds of various sizes of motors will give an idea:

Number of Cylinders	Bore	Stroke	Cranking Speed
4	2.87	4	210
4	3.5	5	132
4	3.75	5	124
4	4.12	4.5	135
6	3.38	5	108
6	3.75	5.5	104

Under normal conditions the draw on the battery varies from 65 to 110 amperes. Under adverse conditions such as a cold motor and a chilled battery the initial kick may be as high as two and one-half times the normal running current but this maximum draft is only for a fraction of a second.

In all Gray & Davis systems the starting and lighting machines are separate units although in the special system recently brought out for Ford cars these two are mounted one above the other in a single case. Only 6-volt systems are built and the single wire is standard construction.



Upper—Type T generator with armature and fields exposed by removing the side cover
Lower—Gear-driven generator. Note oil hole just above gear and general accessible construction

Recent Court Decisions—No Garage in Park

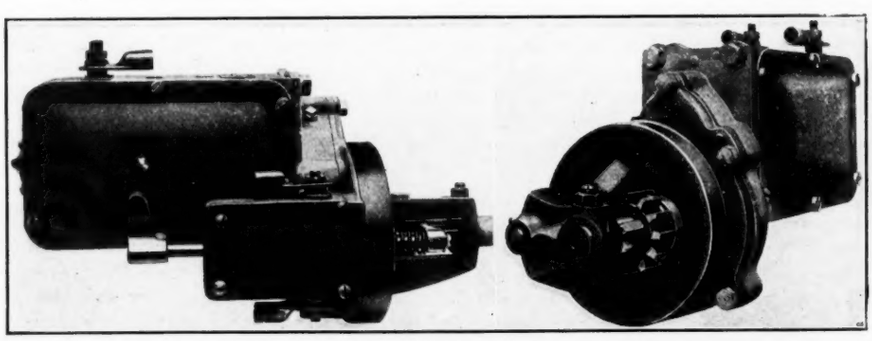
In an interesting case recently decided in Oregon, it was held that the park commissioners of Portland did not have the right to build a garage to house cars which were used by the park commissioners and park employees in a part of the park adjacent to the street.

Landowner Plaintiff

Suit was started by a landowner who owned property across the street from the park to procure an injunction against the commissioners on the claim that they were diverting part of the pleasure grounds for unauthorized purposes. The City of Portland has secured the park's site in the year 1871 and in the year 1909 the ground opposite it had been purchased by the party bringing the suit.

Court Ruling

The Court held that the park commissioners did not have the right to make excavations preparatory to building a garage for the storage of automobiles and motor trucks to be used by members of the park board and other employees, as the park was to be used exclusively for pleasure purposes and accordingly issued an injunction against the board.—*Messinger vs. Mische*, 142 *Pacific* (*Oregon*) 612.



Enclosed flywheel type of Y motor with side mounting of the switch. The driving gear is clearly shown at the right

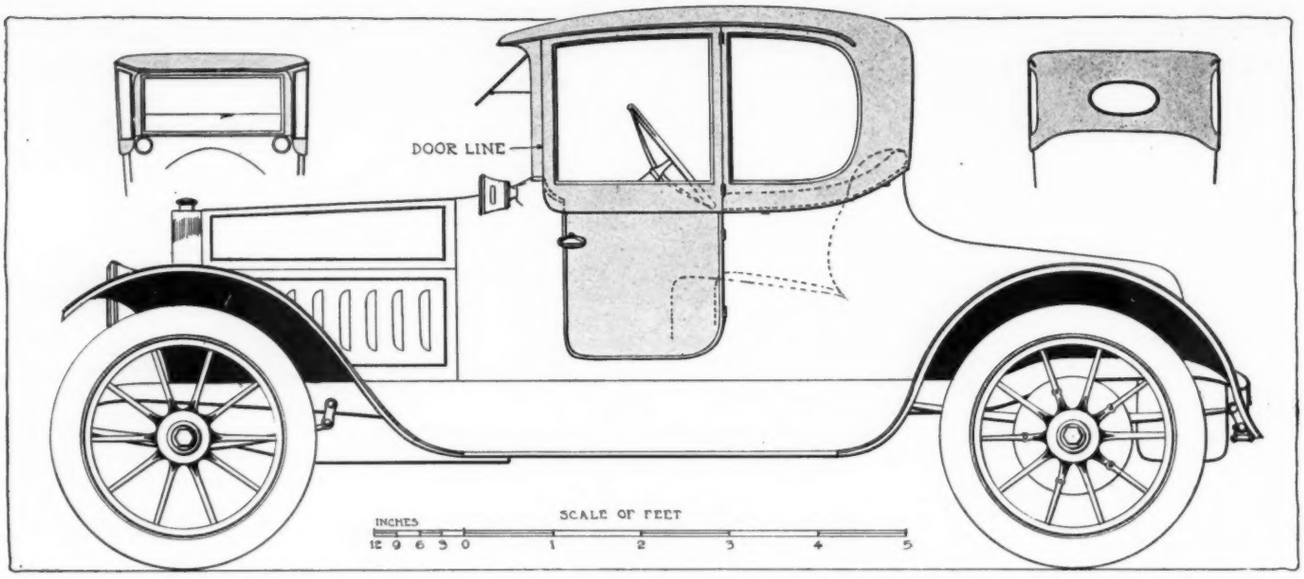


Fig. 1—Special coupé fitted to 1914 Cadillac runabout. This may be removed without leaving any disfiguring marks

Coupé Bodies for Runabout Use

Suggested Designs for Tops Which May Be Applied Directly to Runabout Without Necessitating Material Changes—Ordinary Top Irons Are Utilized

By George J. Mercer

THERE is considerable activity in the body shops converting runabouts and touring cars into closed bodies by the addition of an upper structure that can be easily removed when the warm weather returns. At present nearly all the changes made are by the addition of tops that make the body into a coupé or limousine. The falling type of top, like the landaulet, is not in fashion for this quick change. Some body builders are equipped with parts already made up for certain makes of cars, and are prepared to assemble same and get the car out at short notice. This will make the price to the buyer an interesting figure, because the parts are made in quantities. Nevertheless individual designs will be required to a large extent, and to illustrate this, two makes of popular cars are shown with tops for changing the runabout into a coupé.

Ordinary Top Irons Used

A 1914 Cadillac factory model is shown in Fig. 1; it must be taken into consideration, that, when this top is made that it is founded on the essential that the parts added can be removed when warm weather returns and the original features restored without showing any defacement of the painted surface. Hence in assembling the top on the car, the regular top iron sockets on the body are utilized for attaching the top at the sides and rear corners. The framework of the top is made to fit over and come flush with the under side of the socket, completely covering it, and a stud is let into the framework and fastened with a nut at the bottom. These sockets provide four fastenings and take care of the sides and back. At the front, the sockets for the windshield are used in similar manner to receive studs set into the front posts.

New doors are made, the hinge line on the old doors preventing their use, as it will not line up with the hinges on the upper part. The lock handle must run through to the outside, and as before mentioned it is the intention to leave the door of the runabout without changes so that it can be reassembled.

The upper structure is made to offset outside the body line so as to cover the socket irons, and the miniature front and back views show this offset line continued across the doors. Looking at the side view again, it will be noted that the offset belt line is continued forward and rounded up until it forms the door line at the front post. This will make the upper part of the door wider than the lower part, the reason for this being that the door line is established in the body and the front post is established by the bearing for the windshield. In order to have the door meet the post without having wide framing that will obstruct the vision, the door is made in this manner. The original shape of the cowl is indicated by dotted lines and where the door overlaps the cowl it is free from contact with the painted surface and the trimming inside the door will serve as a windbreak. The lower part of the door will fit into the regular door opening and special hinges are made to allow of their use at the old hinge plates without cutting the pillar.

Regular Windshield Utilized

Doors made in this way will not permit of the glass being lowered, or at most not over 2 inches. The side and rear glasses are also stationary but the front is made with the regular windshield, the upper part a visor and the lower to swing for ventilation.

A rounded top for this design will add to the cost of manu-

facture. Aluminum panels are used throughout, on the sides, back and roof, the metal being joined as far up on the roof as the width of the sheets will permit. The ends are well fastened with wood screws and then soldered, while the metal is also turned under on the lower edge and into the window openings. The absence of moldings and the extreme rounded effect is decided by the intention to make the upper part conform to the original body lines. The framing is of wood, and this is made as light as possible, not only to save weight but to diminish the offset of the top from the body lines as much as the conditions will permit.

Frameless Glass Windows

The size of the body will govern the size of the top framing, because it fits over and outside the body, the height being determined by proper headroom over the seat cushion. The windows are frameless glass with natural wood garnish inside and the most suitable trimming is a dark cord cloth that will look well with the leather finish of the seat and cushion. This trimming will be finished smooth and will cover the sides, back and roof and one dome light is placed in the center of the top.

Fig. 2 is a design of top fitted to an Overland runabout, the lines are different from Fig. 1, but they are more suitable for the straight lines of this body. It is fastened in the same manner as the previous design and the front framework rests on the bearing previously occupied by the windshield. In this design a bent corner glass is used to piece out the space between the door and the front post and this bent glass corner is equally applicable to the design in Fig. 1.

The construction of this top is less expensive than Fig. 1. The top is covered with canvas over wood bows, the cloth ends being fastened under the drip moulding that runs all round the top. The back and rear side panels are one piece of aluminum which is fastened at the top under the drip molding and under the molding around the window openings and at the bottom it is turned under and fastened with screws to the bottom edge of the framework, the door panels and the narrow belt panels are also aluminum and the posts of wood. The door window is made to drop about 12 inches, the rest of the windows being stationary except the front windshield; all the windows are frameless glass and the door glass is supported with a lift strap. Wood with natural finish is used inside on the window edges and the same applies for the trimming and the dome light as for the design in Fig. 1. The miniature end views complete the illustrations sufficiently to convey the appearance of the design from the several veiwpoints, and the same rules for proportions apply as before mentioned. The accompanying scale in feet and inches will permit any desired measurement being obtained on the larger illustrations and the miniature views are made just one half the size of the large drawings.

The cost of a top like either of these designs will be governed by the workmanship, material used and the reputation of the maker. Such tops are often made at a middle figure of $200.

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Hints for Closed Car Trimmings

On the doors there should be large pockets covered with a flap and the tufted trimming line can be carried across the door above the pocket. At the bottom of the door the carpet will run up to the pocket and will match the material in shade and the silk curtains on the doors, rear side windows and the back will also harmonize. If possible, the door curtain should not be fastened to the door itself but on the top-rail above the door, thus avoiding possible staining of the curtains by the rain when the door is opened.

The doors should have inside handles and sensible hinges and locks. There is a toilet case on each side of the car just back of the door and additional appointments may be added to suit the tastes of the customer, but there is not space to place much more than here specified.

The trimming designs of closed bodies at present aim to give as soft a cushion and back as possible. Fewer buttons are used and the small biscuit and the pipe-and-point are seldom found on the new cars. The superseded designs no doubt kept the trimming in good order much longer, but the present effort is to secure the same soft effect in a new job as was formerly found only in a body that had seen service.

Harmonious Color Schemes

Color designs seem to be definitely settled to the rich sober hues that are modest and show refined taste. It is a rare thing now to see a closed body painted other than the conventional dark colors. This tends to make the cars look alike and it allows a design of real worth to stand on its merit. A conspicuous color will often attract the attention of the customer and bias the judgment, but where a sober, harmonious color scheme prevails on the several body styles, a customer's attention is not diverted from those essential features that they have predetermined are necessary.

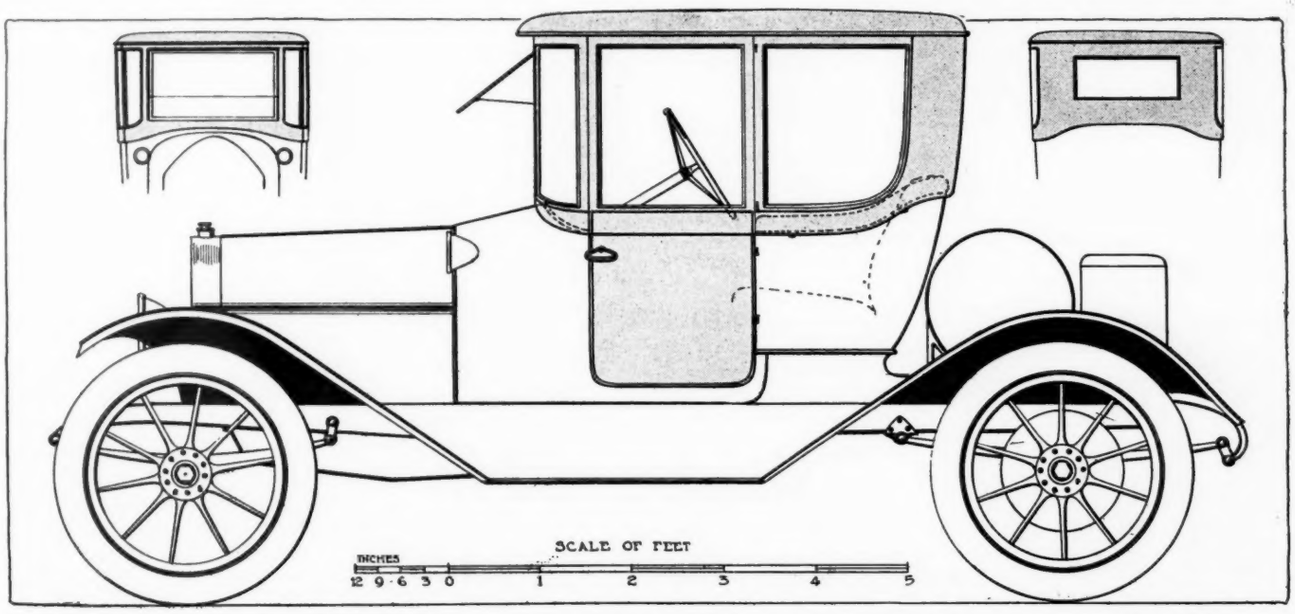
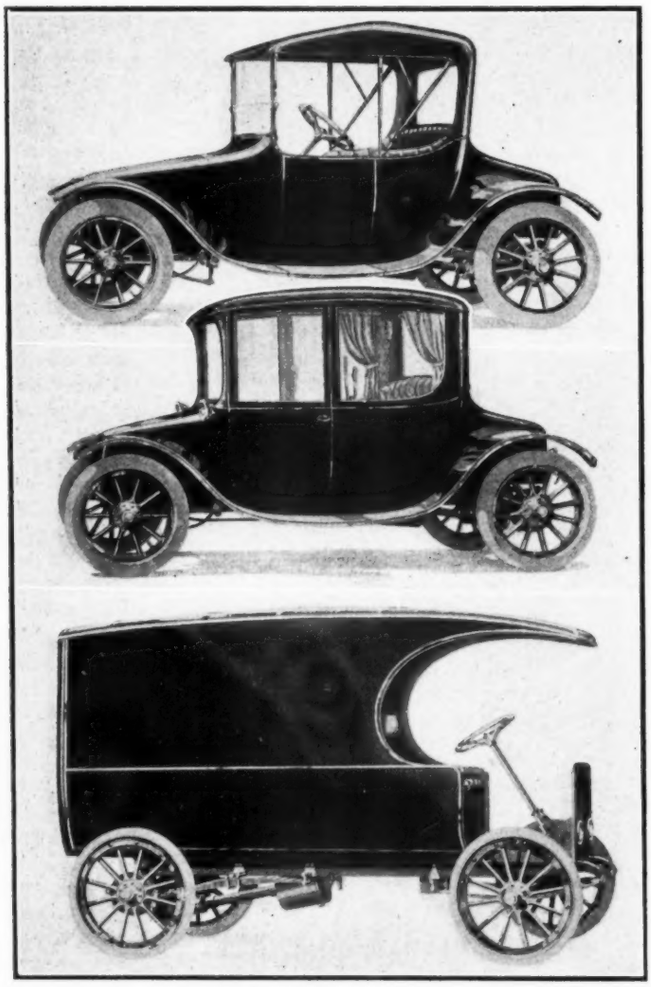


Fig. 2—Overland runabout body with special coupé top mounted. Note different design from Fig. 1 to conform with body lines

Milburn Electrics in Three Models

Line Consists of Coupé, Roadster and Delivery Wagon —Light But Strong Construction a Feature—Worm Gear Drive—Mileage Obtained 50 to 75 Per Charge



Upper—Milburn electric roadster which, fitted with seventeen-plate twenty-cell batteries and capable of about 70 miles per charge, sells for $1,285

Middle—Coupé type, which has twenty-cell, fifteen-plate batteries and travels 60 to 70 miles on a charge. It lists at $1,485

Lower—750-pound delivery wagon, the chassis of which is priced at $985. Bodies of all types are $100 and upward

THE Milburn Wagon Co., Toledo, O., long established in the vehicle-making business and a large producer of bodies for the automobile trade in general, has placed upon the market the electric vehicle with which it has been experimenting for the past 2 years. The car appears in three models—a coupé at $1,485, a roadster at $1,285 and a delivery wagon at $985. Not only does the concern bring the electric down into the comparatively low-priced field, but the construction is lighter than that generally applied to the design of electrics.

All three models have practically the same specifications, although the wheelbase of the delivery is 90 inches, whereas that of the passenger types is 100 inches. Motors and controllers are of General Electric make and batteries of Philadelphia, twenty-cell type. Cantilever springs suspend the passenger chassis, while the delivery uses semi-elliptics in front with cantilever rears. There are four forward speeds provided, and tires on the roadster and coupé are 30 by 3 1-2 pneumatics. The roadster has the greatest mileage per charge, it being capable of 60 to 75 miles, it is said. The coupé will run as far as 70, and the delivery as much as 50 miles on a charge. Worm gear axle drive is employed.

The coupé body is very graceful, with long stream lines, and although it is somewhat smaller than the conventional heavier one found on most electrics, it provides ample accommodations for four persons. Large doors, 28 inches wide, and sashless glass windows add to the attractive exterior, which is painted a dark blue. The interior is commendably well appointed, containing the complete equipment found in inclosed bodies of the highest type. The upholstery is of French fabric specially made for the car. Mechanical window lifters are fitted to both doors and to front and rear windows.

Low Center of Gravity

The body is hung low on the cantilever springs. This low center of gravity provides a factor of safety against the possibility of upsetting or skidding. The manufacturer states that preliminary tests have shown the reduced weight of the Milburn makes it very easy to control in crowded traffic.

The coupé weighs approximately a ton, and with its battery of twenty cells, it attains a normal speed of 17 miles per hour and a maximum of 20. It has a mileage ranging from 60 to 75 on a charge, the rated amount of which is 180 ampere-hours.

The motor is of high speed special design, and the controller is a continuous-torque, non-arcing, drum type which gives four forward speeds and two reverse. Both speed control and steering are by horizontal levers.

The front axle is fitted with Bower roller bearings, while the rear axle, which is of three-quarter floating type, employs Hyatt heavy-duty roller bearings. Its shafts are of chrome-vanadium steel. The drive is direct worm type with no universal joints, and is carried on Hess Bright ball bearings.

The full cantilever spring units are of chrome-vanadium steel, self-lubricating. Twelve-inch, Thermoid-lined brakes are on each rear hub, and the construction is such that none of the braking strains is taken through the worm drive of the motor.

Alarm Prevents Power Waste

A feature which is calculated to eliminate unnecessary waste of power is an automatic alarm which rings if the brakes happen to be applied while the power is on.

The roadster has the same specifications as the coupé, only it is about 100 pounds lighter. This less weight together with its 25 ampere-hours more battery capacity due to the cells being of seventeen plates instead of fifteen as in the coupé, give the roadster a mileage of approximately 70 under normal driving conditions. The normal speed is 19 miles an hour with a maximum of 24.

Instead of having lever steering, the roadster is fitted with

a 16-inch steering wheel connecting with a worm-and-nut type of steering gear. Distinctive appearance is given it by the use of a rain-vision windshield and a special one-support top.

Delivery Car Capacity 750 Pounds

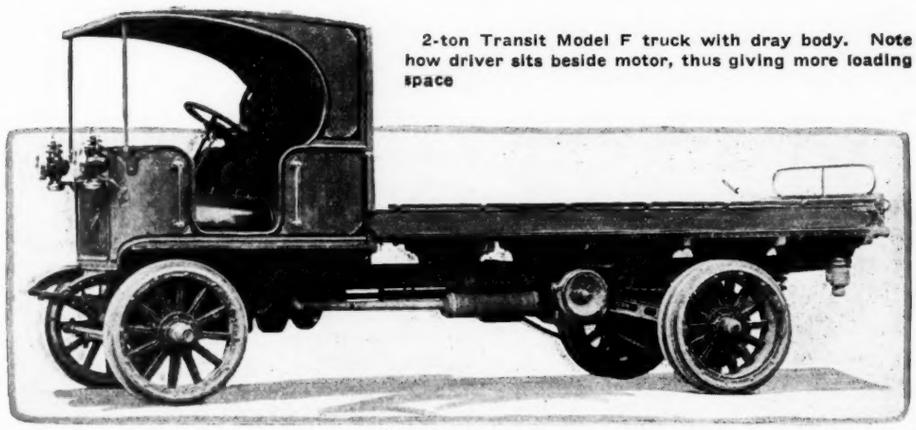
The delivery machine, with a 90-inch wheelbase, has a carrying capacity of 750 pounds in addition to the operator and one passenger. The price of $985 covers the chassis only, due to the wide variety of body types required for various conditions of service. Bodies of all forms are furnished at prices ranging from $100 upward, the styles being determined by the use for which the vehicles are intended.

This commercial car has a battery capacity of 180 ampere-hours also, and a normal speed of 14 miles an hour with a limit of 17. It will run from 40 to 50 miles on a fully charged battery.

The equipment of all the models is complete, consisting of two 6-inch front lamps, tail lamp, two inside corner lamps in the coupé, bell voltmeter, speedometer, 8-day clock, tire pump, hydrometer, jack, tools, and so on. Although the 30 by 3 1-2 tires included in the standard equipment are Goodyear special electric pneumatics, Motz cushion tires may be had optionally at an extra charge, these being of 32 by 3 1-2-inch size. The delivery car is equipped with 32 by 3-inch solids, made specially for electrics.

Four Chassis for Transit Trucks

Models Vary from 1 to 5-Ton Types—Two-Thirds of Payload Is Carried on Rear Wheels



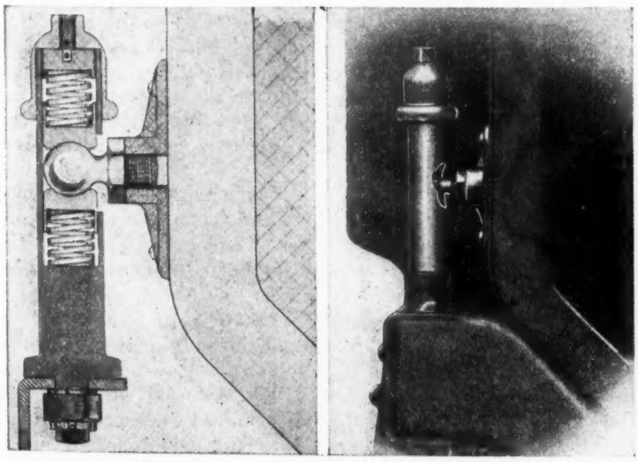
2-ton Transit Model F truck with dray body. Note how driver sits beside motor, thus giving more loading space

THE Transit Motor Truck Co., of Louisville, Ky., which is entering upon its fourth year of active manufacture, offers Transit trucks for 1915 in four models, of the following capacities:

Model E, 1-ton, $2,000; Model F, 2-ton, $2,850; Model T, 3.5-ton, $3,500; Model V, 5-ton, $4,500. The prices are for the chassis only, and bodies of any style desired are furnished at additional prices depending upon style and size.

Driver's Cab a Feature

A new feature of the Transit truck is the design of the driver's cab which not only renders the motor more accessible but affords greater loading space and better load distribution than is found with trucks having a hood over the motor and the driver's seat placed back of the motor. In this design the driver's cab is built the width of the body and arranged so that the driver sits on one side of the motor while the helper sits on the other, the motor being covered by a sheet metal hood between the seats. By this construction a loading space of 3 to 4 feet is gained which means that for a given length of loading space the wheelbase may be made proportionately shorter and the amount of overhang of the body back of the rear axle is reduced. The proportion of all Transit trucks is such that two-thirds of the payload is carried on the rear wheels.



Left—Detail of radiator mounting used on Transit trucks. Right—External view. This ball-and-socket spring suspension provides a universal action protecting the radiator from torsional strains

All models are built on the same general design and the following equipment and specifications apply to all models alike: The Continental motor equipped with Mea magneto and Rayfield carbureters is used in all models. The clutch is the Hele-Shaw universal type. Timken front and rear axles and jackshaft are used, the latter carrying a selective type gearset with Timken roller bearings throughout and having three speeds forward. All models are chain driven. The frames are of pressed steel of the fish-belly type.

Three-Point Suspension

The motor is mounted on a sub-frame having three-point suspension and the drive from the motor to the jackshaft is through a straight shaft fitted with two universal joints.

The Ross steering gear is mounted on the right side as are also the control levers. Semi-elliptic springs are used all around and in addition to these a coil bumper spring is used with the front and a cross supplementary spring in combination with the rear springs, this cross spring coming into action only when the truck is loaded.

The 1-ton is offered with a wheelbase of 120 inches to 144 inches; 2-ton, 132 inches to 144 inches; 3.5-ton, 144 inches; 5-ton, 144 inches to 156 inches.

Business Gain in Western Canada

Trade Is in Best Condition for 3 Years, Despite European War—Farmers Buying Cars—Agencies in Demand—Sales Plentiful—Truck Field Developing

By A. C. Emmett

WINNIPEG, MAN., Dec. 10—In spite of the European war, the automobile trade in western Canada is in a better condition at the present time than it has been for the past 3 years.

A general review of the trade reveals the fact that the dealers are all doing a good business and in some cases such as the Ford, Studebaker, Hupmobile, Overland and cars of the medium-priced class their sales records show that business for the month of November was from 35 to 50 per cent. in advance of the record for the same period in 1913.

Horses to War

A great deal of this improvement is due to the heavy buying by farmers, who, in the provinces of Saskatchewan and Manitoba, have exhibited a tendency to replace their teams with a light car and sell their horses to the British war department for remount purposes. The trade in the cities is, however, still of a good class and quite a number of high grade cars have been sold in the cities of Winnipeg, Brandon, Regina and Edmonton.

Traveling representatives of the firms who act as factory distributors for American manufacturers, send in optimistic reports from every part of the three provinces and accompany the reports with signed contracts covering 1915 business and orders for the immediate shipments of demonstrating cars.

The phenomenal fall weather, which has been enjoyed throughout October and November, has had the effect of keeping cars in use for a much longer period than is generally the case and it has been interesting to note the number of country buyers who have come into the city and taken delivery of their new cars and started for home by road. One day in particular, November 18, no fewer than seventeen new owners started from various hotels in this city driving new cars to points widely apart in the province of Manitoba.

Good for 1915

Manufacturers' representatives who have visited Winnipeg with a view to looking over the territory for agency purposes have been surprised at the demand which they have found existing and have advised their factories to send forward shipments promptly and take care of the needs of agents in the future as in their opinion Western Canada will be a good market for cars throughout the whole of 1915.

Developing Truck Business

Another phase of the situation which is receiving the serious attention of the trade are the possibilities that exist for the opening up of good business in the motor truck field with trucks of 1 and 2 ton capacity for use by farmers. An educative campaign in this respect was discussed at the last meeting of the Winnipeg Motor Trades Association and a committee was appointed to go thoroughly into the matter and report for the benefit of members at the next general meeting.

That dealers are making no sales that are not founded on the best business policy under existing war conditions is proved by the fact that no second-hand cars are taken in part payment of a new car until such time as a buyer is found for the second-hand car at a price mutually agreed upon between the dealer and the purchaser of the new car. This arrangement has led to a little extra effort on the part of the dealer to locate buyers and secure business in a new car and territory which was considered unpromising for the sale of new cars at the present time has been found a good market for the second-hand car and over 100 of these cars have been sold.

Farmers Buy

As THE AUTOMOBILE representative I have traveled a great deal in Manitoba and on every hand has been found evidence of the desire to purchase a car either for the sake of its utility in the life of the farm or simply for the added opportunities it provides for social intercourse. This desire coupled with the fact that farmers were able to sell quite a number of horses to the British government has been responsible for the sale of a number of cars sooner than otherwise would have been the case and the dealers are consequently in a better condition as far as winter trade is concerned than they have ever been before.

At the commencement of the war it was anticipated by the pessimistic brigade that the business of the automobile dealers would come to an absolute standstill and this opinion was shared to a very great extent by a number of influential business men but those who were in actual touch with the motor industry saw the signs of good business and with commendable foresight closed out big contracts with the manufacturers for immediate delivery so that when the combination of good weather and high prices for wheat placed the farmer in a good position and brought him into the market for a car they were ready to give him immediate delivery and close sales which might not have been secured at a later date.

Medium Cars Sell

Ford sales are of course not to be wondered at but take as a basis for demand the sales made by the Winnipeg distributing branch of the Ford company during the month of November are nothing short of phenomenal and would lead one to the conclusion that all the buyers were out to get a car that would be low in cost and cheap to operate. That this was not the case was soon evident by reports from the Overland, Studebaker, McLaughlin-Buick and Hupmobile agents. All these reports were of the most optimistic character and backed up their statements by the addition of the names of those to whom the cars were sold and the names of those who had applied and signed agency contracts for sub agencies during 1915.

As all these contracts are based on the sale of three cars before an agency contract is given it will be readily seen that the outlook for business in western Canada as far as the three provinces of Manitoba, Saskatchewan and Alberta are concerned is extremely good and when the total sales are figured at the end of the 1915 season it will be found that the business has been equal to the best year that the dealers of Western Canada have ever had.

Latest statistics issued by the municipal commissioner for the province of

Manitoba show the total of cars owned in this province as 7,340 at the end of September, 1914, an increase of over 1,200 cars during the past year.

Turning from the car sales to the accessory and tire trade, which form a barometer for conditions in the use of cars already owned, it would seem that there is no falling off in business on this side of the trade as in the case of the tire concerns the reply to a query as to conditions that are likely to obtain during 1915 brings the answer that conditions were never better. Orders on hand are in excess of business at the same time last year and judging by the consignments of tires ordered forward for spring delivery there is none of the owners of cars in the province who will not be making use of them next year.

The accessory dealers are finding business also equal to other years and are sending forward good supplies of material to country garages who are overhauling cars and getting them in shape for next year's work.

"Business as Usual"

Fancy stories of conditions in Canada since the outbreak of the war have been circulated in some irresponsible papers in the United States, such as: "Automobile owners in Winnipeg and Manitoba are using their automobiles with ropes on the wheels in place of tires as the war has made them so hard up they cannot buy tires." One factory representative actually arrived in Winnipeg from the headquarters of a big tire factory with the idea in his head that this was true and was more than surprised to find, "Business as Usual," the slogan of everybody with whom he came in contact. The gospel of hard times cannot be preached very successfully in western Canada just now and if there is anyone suffering from the war there are others who are ready and willing to tide them over the hard spot and keep the family together whilst they help the Motherland to fight her battles by sending forward men and supplies as fast as they are called for.

With this condition of things the automobile manufacturer need not be scared away from the Canadian market but should rather lay his plans to secure a share of the ever increasing business that will come with the development of western Canada when the war ends.

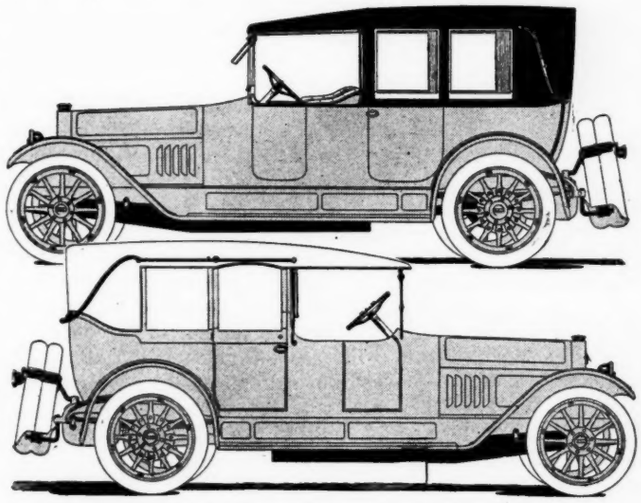
Some New Locomobile Special Bodies

SEVERAL bodies of more than usual elegance are on view at the New York City sales room of the Locomobile Co. of America. This private exhibition held there marks the inauguration of a special department for the planning and ordering of specially designed bodies.

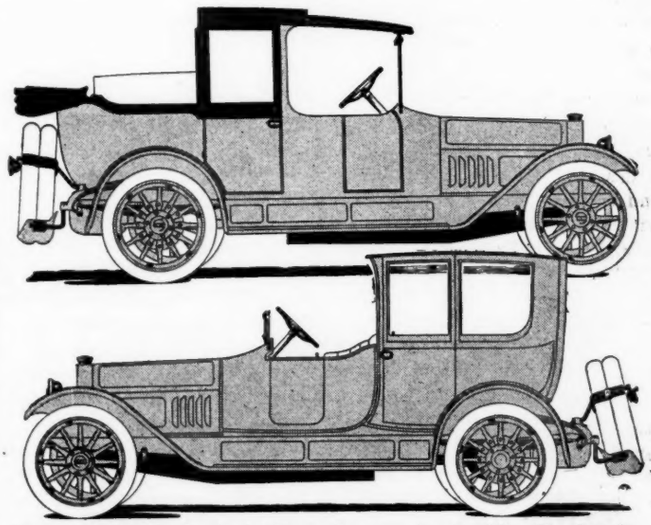
Two of these new models are imported and three are made in this country. A handsome example of the French body worker's art is shown in the coupé built by Henry Binder, Paris, and mounted on a 38 chassis. It sells for $6,600. The other French design is a phaeton-landaulet by Bail Jeune Frères, Paris, and placed on a 48 chassis. This model lists at $7,500. The top and sides fold down so that the car can quickly be converted into an open model.

The American bodies are of Holbrook make, a landaulet-limousine on a 38 chassis selling for $6,150 a coupé-landaulet at the same price and a semi-touring car placed on a 48 chassis and listing at $6,800. The latter equals in utility the phaeton-landaulet mentioned above, as it can be used as a closed or open car as desired.

This new department, as announced in THE AUTOMOBILE for October 8, is managed by J. Frank de Causse, who has been connected, as assistant manager, with Kellner & ses Fils, and it is planned to furnish patrons with bodies to their own specifications as regards general design, equipment and finish.



Upper—Phaeton-landaulet by Bail Jeune Frères, Paris, on Locomobile 48 chassis, $7,500
Lower—Holbrook semi-touring car on Locomobile 48 chassis listed at $6,800

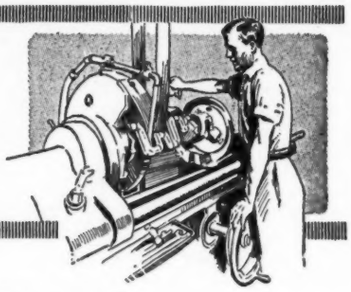


Upper—Holbrook landaulet-limousine on Locomobile 38 chassis, selling for $6,150
Lower—Coupé by Henry Binder, Paris, on Locomobile 38 chassis, selling for $6,600

16-Year Contract for Motor Mail Man

SILVER CITY, N. M., Dec. 5—What is said to be the roughest and longest star route in the United States is that which runs from Silver City to Mogollon, 90 miles. The post-office department has just let the contract for carrying the mail over this route by means of automobiles to C. A. Bennett of Silver City for $10,000 per annum. The contract runs for a period of 16 years. It requires that the first-class mail shall be carried six times a week and fourth-class mail three times a week. Besides using a light motor vehicle, Mr. Bennett will place a motor truck in service to transport the heavier packages, such as come by parcel post. The mountain road runs via Gila, Cliff, Buckhorn and Jackson, each of which towns are also served under the contract. The treacherous nature of the Gila river, which often goes on a big rampage, has caused an aerial tram to be constructed by which means the stream is crossed in a large cable car that runs high in the air. This aerial car is large enough to carry the motor truck, load and all.

The Rostrum



This department is for the instruction of the readers and all are at liberty to ask questions. Be sure to give full name and address that we may send you a reply by letter if there is no space in the Rostrum. If you wish to sign a fictitious name, also sign your own.

Directions for Adjusting Main and Connecting-Rod Bearings

EDITOR, THE AUTOMOBILE:—I would like to have you explain clearly how to fit babbitt bearings on crankshaft and connecting-rods, either when putting in new ones or when taking up slack in old ones?

Cape Girardeau, Mo. P. J. LOUGHLIN.

—The treatment depends on the condition of the bearings. If only slightly worn, the bearings may be adjusted by removing shims or filing the bearing caps, depending on which method has been adopted. If the bearings are scored or worn out of round, or if new bearings are put in, the surfaces must be scraped.

If the bearing surfaces are in good condition and not worn out of shape, a slight amount of adjustment should be sufficient to make them tight. Generally there are several shims under the bearing cap and by removing these one by one, the looseness will disappear. A typical connecting-rod bearing with shims is shown in Fig. 2. Be careful not to remove too many shims so that the bearing cap will bind when drawn up. Remove only enough of the shims to make the bearing a snug, but not a tight fit. When shims are not used, the lost motion may be removed by filing the surface of the bearing cap as shown in Fig. 1. In case too much material is removed a copper or paper shim or shims should be inserted to make the cap fit. Care should be exercised in filing to preserve the flat surface of the bearing cap. This requires that the file not only be held flat against the surface but also that the movement of the file be carefully executed.

If the bearing is scored, worn out of round or if the bearing is new, it will need scraping. If possible this work should be done by an experienced man. Scraping of the connecting-rod bearings may be done without tearing the motor down but if the main bearings require scraping, the motor must be dis-assembled, the crankcase placed upside down on a suitable support with the crankshaft and flywheel still in place. We will describe the method of scraping the main bearings as this is more difficult than scraping the connecting-rod bearings. The main bearing caps are removed, and the crankshaft bearing surfaces are painted with a solution of Prussian blue. Then the crankshaft is rotated a few times and removed. The high spots of the bearings will be coated with the blue. These spots are carefully removed with a special scraping tool, care being taken not to cut too deep. Then the crankshaft is repainted, replaced in the bearings and rotated. In this way the high spots are once more determined. The crankshaft is removed and these spots cut off. By successive treatments, the few large high spots which there were at the outset have gradually given place to smaller and more evenly distributed ones until finally when the operation is completed these spots will be very small and uniformly distributed over the entire surface showing that the bearing makes contact with the crankshaft surface at practically every point. In a similar manner, the surface of the main bearing caps and the connecting-rod bearings should be put in condition.

Six Gives Smoother Torque

Editor, THE AUTOMOBILE:—1—Kindly tell me whether in general, six-cylinder motors are considered better than four-cylinder and why?

2—Give me a simple rule to compute horsepower.

3—Which is best, cone clutch or multiple disk?

Delmont, Pa. H. N. SMITH.

—1—The advantage of the six is that it has a smoother torque, that is, since it has two more cylinders there are three impulses instead of two, during each revolution. The result is that the six pulls better at very low speeds, and will accelerate more rapidly on hills. It runs smoother, especially at low speeds, because it is in better balance and the reciprocating parts are smaller per cylinder.

2—You may use the S. A. E. formula, in which horsepower $= \frac{D^2N}{2.5}$ where D = the bore in inches and N = the number of cylinders. This formula assumes that the piston speed is 1,000 feet per minute and that the mean effective pressure is 90 pounds per square inch.

Since a piston speed of 1,000 feet per minute is a low maximum for modern motors a more accurate result can be obtained from the modified S. A. E. formula in which the horsepower $= \frac{D^2N\,S\,R}{15{,}000}$, where D = bore in inches, S = stroke in inches, R = revolutions per minute, and N = number of cylinders. In this formula piston speed is taken account of by the stroke and speed in revolutions per minute.

3—Both seem to be equally good. Both may be found on the highest-priced and the cheapest cars.

Information on Welding and Brazing

Editor THE AUTOMOBILE:—I would be very pleased if you would furnish me with some information regarding welding and brazing processes or refer me to the proper

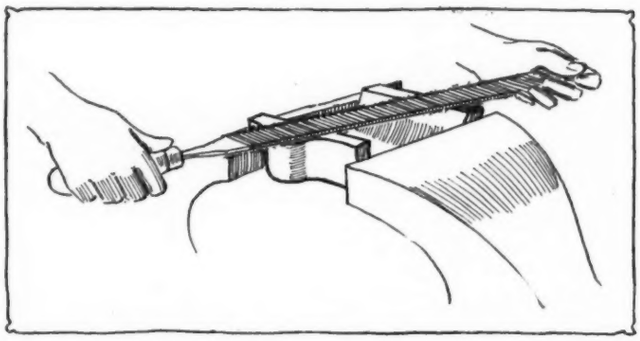


Fig. 1—Method of filing bearing. Care must be taken to put an even pressure on the file so that the same amount of material is removed on both sides

authorities for same. I do not see any advertisements or other information along these lines in your current issue.

Midville, Ga. J. R. NORTH.

Directions for oxy-acetylene welding were given in THE AUTOMOBILE for November 12 on page 885.

Brazing metals, which means that they are joined by a film of brass, requires a red heat and borax is generally used as a flux to protect the metal from oxidation and to dissolve the oxides formed. Heating must be done by means of a blow pipe torch, gas forge, coke or charcoal furnace and cannot be done by means of a soldering iron.

Before work is assembled for brazing it should be carefully cleaned. The parts are then fastened together, generally by pinning but sometimes wire bolts or clamps are used. If possible the pieces should be fastened in such a way that the work may be turned over during the process of brazing without changing the relation of the parts.

—The following are some books on welding and brazing: Hard Soldering, Welding and Brazing, $1, J. N. Hobart, McGraw-Hill Book Co., 239 West Thirty-ninth street, New York City; Soldering and Brazing, J. N. Hobart, $1, David L. Williams Co., 231 West Thirty-ninth street, New York City.

How to Solder Aluminum

Editor THE AUTOMOBILE:—Would you kindly give me any information you can on soldering aluminum?

Philadelphia, Pa. JOHN E. JAMES.

—Aluminum is soldered by the use of a blow torch. A solder which may be used without a flux is composed of 75.5 parts of tin, 18 parts of zinc and 2.5 parts of aluminum. The parts should be slightly heated before applying. The solder should be forced in place by means of a stiff metal brush. Another solder which requires a flux however, is made up of 80 per cent. tin and 20 per cent. zinc, stearic acid being used as a flux.

The objection to soldering aluminum is that the joint is not very strong. A solder which is claimed to overcome this difficulty is the German-American which was described in the September 17 issue of THE AUTOMOBILE on page 564.

This description is reprinted in part:

> To dispense with the present oxy-acetylene method of repairing fractures in aluminum parts is the object of the German-American Aluminum Co. which has just established a sales office at 25 West Forty-second street, New York City.
>
> The new solder is the invention of Karl R. Peters, a metallurgist of Berlin, Germany, and at the present time it is being manufactured in this city as well as in that country. The inventor claims that no breaks are too complicated to be repaired by the new method and that the work can be done at a saving of at least one-third the cost of the welding job. The strength of the solder, according to Mr. Peters, is about double that of aluminum as regards its resistance to tensile strains and even greater as regards its resistance to bending.
>
> In performing the work on an aluminum casting that has been broken into a number of pieces, the various parts are matched as closely as possible and screwed down on a jig. The fractures are then chiselled in the form of a V-shape slot in the same manner as for a welding job. The solder, which melts at a temperature of 400 degrees Fahrenheit, is then run into the slot and finds its way down into crevises between the two pieces of metal. Upon solidifying the joint is made.
>
> Mr. Peters states that he has had 8 years' successful experience with his solder both in this country and abroad. It is a secret composition, containing eight ingredients, five of which are metals and the other three salts of metals. The German-American company will either do the repair work itself at its factory at Port Jefferson, Long Island, or will sell the solder, together with territorial rights and instructions for its use in garages and repair shops. A guarantee is made that regardless of the work to be performed the aluminum will break before the soldered joint under any ordinary strain.

Motor Speeds at 10 m.p.h.

Editor, THE AUTOMOBILE:—1—How many revolutions per minute will the motors on the following cars turn running at 10 miles per hour: Studebaker, Model S.D.; Buick, C-24; C-25; Maxwell, 25; Overland, 81; Regal, D; Oakland, 37?

2—What is considered the most efficient ratio of stroke to bore?

New York City. M. CASSIDY.

—1—Knowing the gear ratios and the tire diameters of these cars, the motor revolutions at 10 miles per hour may be easily figured. Ten miles per hour corresponds to a certain number of feet per minute and this divided by the circumference of the tire equals the number of revolutions per minute that the rear wheel makes, in each case. Multiplying this quantity by the gear ratio, the revolutions per minute of the motor is found. Using symbols for the different quantities involved, the formula

$$M = \frac{S \times R}{D} \times 336$$

is found. M = motor revolutions per minute, W = revolutions of wheels per minute, C = circumference of wheel in feet, S = speed in miles per hour, R = gear ratio, and D = wheel diameter in inches. $\frac{S}{60}$ = speed in miles per minute and $\frac{S}{60} \times 5{,}280$ = feet per minute, then this quantity divided by the circumference of the wheel C gives the wheel revolutions per minute, $\frac{\frac{S}{60} \times 5{,}280}{C}$, then this multiplied by the gear ratio R will give the motor revolutions per minute, or revolutions per minute of the motor = $\frac{\frac{S}{60} \times 5{,}280}{C} \times R$ or $= \frac{S \times R \times 5{,}280}{C \times 60}$

The circumference of the wheel C in inches is 3.14 multiplied by the diameter D in inches; divided by 12 this expression is reduced to feet. Therefore the circumference

$$C = \frac{D \times 3.14}{12}$$

Substituting this in the above formula

$$\text{r. p. m. of motor} = \frac{S \times R \times 5{,}280 \times 12}{D \times 3.14 \times 60}$$

$$= \frac{S \times R}{D} \times 336 = M$$

Using this formula, the motor speeds, since the tire sizes and gear ratios are given, are as follows:

	Gear Ratio	Tire diameter	Motor r. p. m. at 10 m. p. h.
Studebaker, S.D.	4 to 1	33	408
Buick, C 24, C 25	4 to 1	32	420
Maxwell, 25	3.58 to 1	30	400
Overland, 81	3.75 to 1	33	381
Regal, D	3.75 to 1	32	393
Oakland, 37	4 to 1	33	408

2—This is a matter of opinion but the average of the principal American motors for 1915 gives a ratio of 1.3.

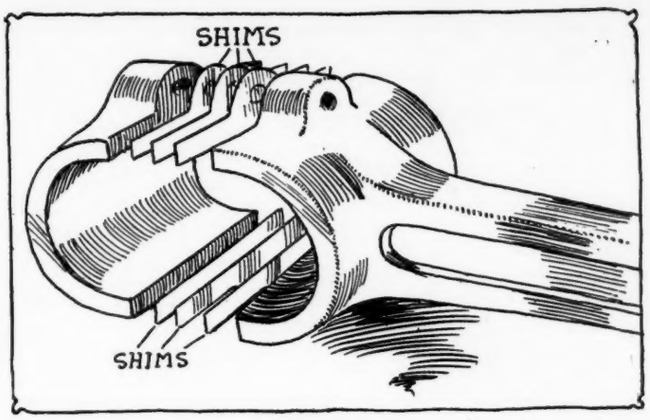


Fig. 2—Connecting-rod bearing end with cap removed to show shims

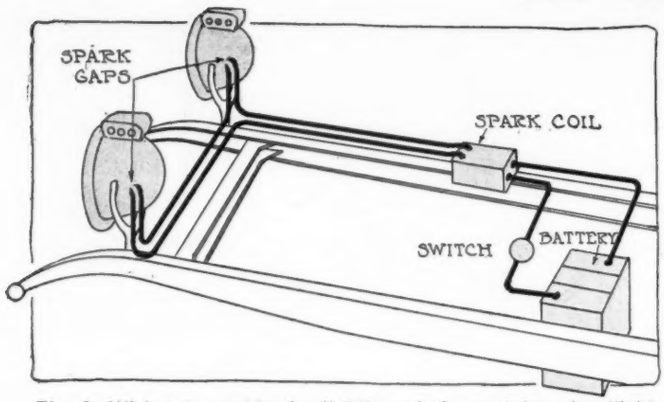


Fig. 3—Wiring to enable the lighting of the acetylene headlights by electricity

This may not be the most efficient ratio but it is probably close to it. It must be remembered, however, that the ratio must vary to a certain extent according to the size of the motor, being less for a large one and greater for a small one. The average bore and stroke of these motors is 3.82 by 5.1

Horsepower of Two and Four-Cycle

Editor, THE AUTOMOBILE:—1—What is the difference in horsepower between a two and a four-cycle motor having the same piston displacement?

2—Would the two-cycle have twice the power of the four?

3—What is meant by the word Baumé?

4—Who makes the Marsh one-cylinder air-cooled motor?

5—What is the right pronunciation of Mercedes?

Jamestown, N. Y. M. K. PALMQUIST.

—1 and 2—In motors of average design there is little difference in horsepower between the two. Although the two-cycle has twice as many strokes per revolution the mean effective pressure is generally not so high.

3—Baumé is a measure of the specific gravity of the gasoline with reference to a solution of salt and water, and the method was invented by a French chemist, Antoine Beaumé. The measuring is done with a Beaumé hydrometer which is merely an ordinary hydrometer with a special scale on it. Certain fixed points were first determined upon the stem of the instrument. The first of these was found by immersing the hydrometer in pure water and marking the stem at the surface of the water. This point formed the zero of the scale. Fifteen standard solutions were then prepared with 1, 2, 3, up to 15 per cent. by weight of dry salt and the hydrometer was immersed in these different solutions and corresponding marks made on its stem. Thus an arbitrary scale was formed for determining the densities of liquids heavier than water.

The hydrometer intended for densities less than water and which would be used for gasoline was marked in a similar way. A solution of 10 per cent. pure salt was used for the zero of the scale and the points at which the instrument floats in distilled water at 10 degrees Reamer or 54.5 degrees Fahrenheit is numbered 10. Equal divisions are then marked off up the scale as far as 50.

4—The concern that made the Marsh has been reorganized and is known as the Sterling Motor Co., Brockton, Mass.

5—This is a Spanish name for a girl. It is impossible to indicate the exact pronounciation but it can be approximated in English by giving the first e the same sound as the e in berry, the second e the sound of i in still but emphasized, and the last syllable should be pronounced as des in destroy. The accent is on the second syllable.

Questions on Ford Magneto

Editor, THE AUTOMOBILE:—Kindly explain the following questions concerning a Model T Ford magneto:

—1—What is the voltage, amperage and field resistance at 1,000 and 2,000 revolutions per minute and how can these speeds be determined?

2—What are the causes of a drop in voltage and amperage?

3—Explain how the magnets can be recharged by use of direct current through the magneto plug.

4—Does low resistance between the field terminals (caused by shunting in lights, electric horns, etc.) injure the magneto?

Newburyport, Mass. NORRIS C. INGALLS.

—1—There is no field resistance since the Ford magneto employs permanent magnets. The amperage depends entirely on the voltage generated and the resistance of the circuit. The voltage at 1,000 and 2,000 revolutions per minute is not obtainable but at 980 revolutions per minute the voltage varies from 16 to 24 depending on the condition of the magnets, it is stated.

2—In the Ford magneto drop in voltage causes missing at low speeds but in general is a drop in pressure, the same as when water flows in a pipe there is a certain drop in pressure between any two points. The drop in voltage, Fig. 4, is explained by studying the flow of water, which is opposed by a frictional resistance and if we have a pipe 2 inches in diameter and 100 feet long and have a pump which supplies water at 100 pounds pressure at one end, then the flow of water will be quite rapid so that a great many gallons will be discharged. The only force opposing the flow of the water will be the friction between the water and the walls of the pipe. If the interior of the pipe is rough more resistance will be offered than if it is smooth. If the pipe is made larger the resistance will be reduced and more water will flow. If it is smaller the resistance will be increased and less water will flow. Likewise if the pipe is lengthened to 200 feet the total resistance will be twice as great and only half as much water will pass through it.

The same may be said of the electrical wire. The volt is the unit of pressure and if 100 volts is applied to 100 feet of wire of a certain diameter a current flow of a certain number of amperes will result. It has a certain electrical resistance which opposes the flow of the current the resistance varying with the material of which the conductor is made instead of according to the roughness of the surface as is the case with the pipe. This resistance also varies with the area of the wire, the larger the wire the less the resistance. Also the resistance depends on the length of the wire.

If the resistance of the conductor is reduced by shortening it, by increasing its diameter or replacing it with a material which has a smaller resistance then the current flow in amperes will be greater and likewise if the resistance is increased in any way the flow will be reduced. If the voltage or electrical pressure is increased and the resistance remains constant then the flow of current must increase and if the pressure is lessened it must decrease.

In a wire of uniform size and material the drop in voltage is uniform from end to end because the resistance of any small unit of length is constant.

3—Six fully charged, 6-volt, 60-ampere storage batteries, a compass and some wire are required for charging the magnets. The storage batteries are connected in series and the negative wire is grounded on the car. The positive wire should have a rod attached to its end and then the magneto plug should be removed and the rod thrust in to make contact with the magneto inside the cover. Place the compass a small distance behind and to the left of the hole for the magneto plug, and have someone turn the motor over until the needle points to the front of the car. Then open and close the circuit by removing the negative wire from the car. The circuit should be held closed for 6 seconds at a time and then broken, twenty-five times.

4—The low resistance is not of itself injurious but if the resistance is low enough to allow a heavy current to flow, there may not be enough current for ignition or possibly the

current will be so strong that it will heat the coils and hurt the insulation.

Questions on High-Speed Motors

Editor THE AUTOMOBILE:—I noticed in one of your recent issues a short article by Charles Duryea on How Rotary Valves Are Timed. I have not had the opportunity of reading the previous discussion therein referred to and would like to be enlightened more particularly on this subject.

1—In timing the intake valve is not the only essential that said timing be so arranged that the gas will have been started through the manifold by a sufficiently early opening as to be ready to supply the greatest volume of gas during the instant of greatest opening of valve and that such maximum opening be sustained during the period of greatest suction or piston speed?

Mr. Duryea contends that gas having started through the manifold while suction existed will continue to ram in after the compression stroke has started. In the Deltal motor described in your columns some time ago, the intake closed 48 degrees past dead center. In your opinion through how many of the 48 degrees of the compression stroke would gas continue to ram in?

2—Was any gas backed out?

3—Is it not a fact that during most of this 48 degree period, the poppet valve remains open only because it is not deemed advisable to shape the cam so as to allow the valve an immediate drop and close?

4—In that same Deltal motor the exhaust opened 68 degrees before dead center and closed 8 degrees after. Is this extremely long opening of exhaust the secret of the high speed attained by this motor?

5—Did not considerable power waste through the valve between the time of its opening and say 20 degrees before lower dead center? Did not the valve at such early opening lift against greater pressure than would exist at 20 degrees before dead center?

6—Is it not a fact that early opening of an exhaust valve of the poppet type is deemed advisable solely for the reason that such an opening affords means of reaching and sustaining the maximum opening throughout the scavenging stroke?

7—If an exhaust valve of the rotary type was supplied that opened 20 degrees before dead center and closed 8 degrees after, but which provided an extra quick and very large opening such that would permit a free and easier exhaust to even a greater volume of exhaust gas than the Deltal motor handled, and if such valve were easier of actuation than the Deltal type, would not such a valve make for more power and more speed?

8—In producing a special high-speed motor the reciprocating parts are made as light as possible. Am I right in assuming that these reductions are made in order to offset the power absorption of the larger valve gearing used, and thus register a greater power than can be obtained from stock motors?

9—Should not the opening of the exhaust valve be governed largely by the length of the stroke?

10—In a rotary valve motor of 4-inch bore and 6.5-inch stroke, equipped with extra large straight passage valve ports and with easily actuated valves and gearing, etc., in which the intake opens 8 degrees after dead center and closes 20 degrees after next dead center, and in which the exhaust opens 20 degrees before dead center and closes 8 degrees after next dead center, in your opinion would a change of such timing to that of the average of 60 engines mentioned by Mr. Duryea, be a change for the better? or worse?

Pittsburgh, Pa. B. D. GAMBLE.

—1 and 2—The object in delaying the closing of the intake valve is to allow the intake to ram in, as Mr. Duryea terms it, after the compression stroke has started. This effect only occurs at high speed. At ordinary rates of revolution a small amount of gas might be pushed back out of the intake valve. At high speed the gas, due to its inertia, will continue to flow in all the time the valve is open, that is through the 48 degrees of opening. However the piston movement represented by 48 degrees on a motor with 5-inch stroke is only .4 inch and therefore only a small amount of gas will be forced out.

3—Yes. Whether the cam allows a quick closing or not is a question of whether silence or maximum power is the more important.

4—Partly. The high speed is due mainly to two things: The amount of combustible mixture taken into the cylinders and the rapidity with which the exhaust gas is disposed of, thus reducing the back pressure. In order to obtain the former, at high speeds, the closing of the intake valve must be delayed. To accomplish the latter, the valve is opened before the piston reaches the end of the expansion stroke. A small amount of the expansive force is lost by so doing but this is more than offset by the gain which results from having a reduced pressure on the piston at the first part of the exhaust stroke.

5—A small amount of power is wasted at low speeds only with this early opening. Regardless of the speed the energy in the gas is largely spent before the exhaust opens at 68 degrees before lower dead center, its expansive force is nearly gone, and its pressure is very low compared with what it was at the beginning of the stroke. When the motor is running slowly some power is wasted but as already explained when it is operating at high speed this loss is more than made up for by the reduction of back pressure.

6—Yes.

7—This rotary-valve motor might develop more power than the ordinary touring car type at touring car speeds but it would not be apt to show the power at high speeds.

8—The reciprocating parts are made light to reduce vibration.

9—The time of opening of the valves, if this is what you mean, depends on the maximum speed of the motor and whether it is to be used for touring or racing, but the size of opening is governed by the piston displacement and maximum speed desired.

10—Mr. Duryea's timing is preferable. He states that the exhaust should open 45 degrees before bottom center and close 8 degrees after top dead center.

How to Wire Gas Lighter

Editor THE AUTOMOBILE:—Will you kindly advise me what is the proper way to wire an electric lighting system for gas head light? Shall I have one coil vibrator for each lamp or just one coil for both?

Houston, Texas. JOE TESORO.

—One coil for both lights should be sufficient. Make the gaps spark small, say not over 1-32 inch, putting the two in series. The wiring is shown in Fig. 3. You might wire the ignition coil to produce the required sparks but without knowing the type of coil you have, details can not be given.

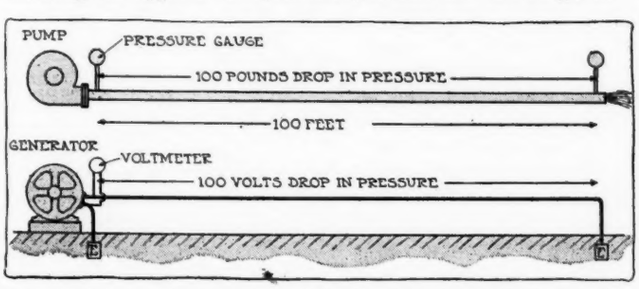


Fig. 4—Diagram showing the relation between the flow of water and electricity

The Engineering Digest

Recent Progress with Alloys—Theory Explaining Self-Hardening Metals Including the Special Steels

SIMPLIFIED HEAT TREATMENT GAINED BY SKILFUL STEEL MAKING

EVERY day, almost, sees new alloys of metals which are placed in the market with a view to the attainment of definite industrial purposes. They have usually been developed at research laboratories, and the improvements which they represent relate to their manufacture, their composition and properties or to their heat treatment. While not entering upon an account of the progress made in smelting, casting, forging and rolling, Leon Guillet, the well-known metallurgist, presents in eleven recent issues of *Génie Civil* a somewhat detailed report of the improvements made in the past few years in the properties of alloys as due to modifications in their composition or the manner of working them. As complicated heat treatment has not been found industrially practicable, by reason of the uncertainty of the labor element and the cost, the improvements in working methods go in the direction of simplification and the reduction of machine work. The self-hardening steels now much used for automobile gears and other parts in France furnish an example of the combination of great strength and durability with simple heat treatment and small correction for distortion.

A few passages from Professor Guillet's account are here rendered with omission of most of the technical explanations and reasonings, as these could scarcely be made intelligible in abbreviated form.

General Principles

Alloys show sudden variations, in their solid state, of some of their properties, such as their specific heat, their expansion or volume, their electric resistance, magnetism, etc., and these variations can be due to a transformation which the whole mass of metal undergoes as a unit, or to reactions among its components or to transformation of one of these. The changes brought about by heating and quenching are of the greatest industrial importance, being intended to increase strength and hardness or resilience. The effect of quenching is to preserve in part the condition which is stable in the metal at the temperature at which the quenching takes place, this effect being obtained by the suppression of the transformation which would take place during slow cooling.

The first condition for being able to harden an alloy by quenching is thus that it naturally undergoes a transformation at a certain temperature, and this fact indicates the importance of metallurgical diagrams for the metal industries. The second condition is that the temperature of transformation is at least reached before quenching takes place. As changes are not instantaneous, it follows also that the heating must last long enough to make them complete, if the full effect of quenching shall be obtained. Finally, as the speed of reactions generally grows with the temperatures, it is pertinent to inquire if it is not advisable to heat to a temperature above that of transformation.

Only in the case of certain nickel and manganese steels is it found that the condition existing before the cooling is completely maintained after it. In all other cases there is after the hardening process always a partial return toward the normal state of the metal. It can therefore be said that while industrial hardening imparts to an alloy a different structure from the normal one it is not the same which exists above the temperature of transformation. In the case of steels, for example, the malleability and high resilience existing above the point of transformation are much reduced in the cooling, and magnetism is restored, but the structure which is characterized by fine martensitic needles at the high temperature is maintained.

In this connection it is observed that if an alloy is heated too far above the point of transformation before quenching, the martensite becomes more and more visible under the microscope, coarser and thicker, and this structure, which detracts from the desired mechanical properties of the metal, is more stable for the high temperature than the finer martensitic structure and is therefore preserved more fully by quenching, as is also shown by experience to be the case. The quenching temperature should therefore never be more than 50 to 75 degrees centigrade higher than the highest transformation point of the alloy.

The Critical Points

That there can be question of a higher and a lower transformation point is due to the phenomenon of hysteresis, which causes the transformation to come at a higher temperature during heating than during cooling. Usually this difference is small, but for some compositions it is pronounced, and recently this phenomenon have been turned to important industrial account. Another factor, besides the composition of the alloy, influences the hysteresis, as for certain alloys it is stronger the higher the temperature is carried, at least within certain limits.

The principle of the influence of composition is shown most strikingly in nickel steels, where a nickel content of up to 25 per cent. lowers the critical or transformation point in the manner shown in the classical Osmond curve reproduced in Fig. 1, which may also serve to illustrate the industrial importance of hysteresis. Consider an alloy whose critical point during heating is at the temperature T while during cooling it is at *t*. To make such a metal take a temper it must be heated to above T to bring about the required molecular change, but to obtain the maximum effect from the quenching the latter should take place in the neighborhood of *t*. One should heat to T + 50 degrees and quench at *t* + 50 degrees. In practice, unless the hysteresis is pronounced, the differences in properties is not very great.

But suppose that *t* lies below ordinary temperature. In that case no retransformation will take place if the metal is left alone, and the alloy will be self-hardened and will have at ordinary temper-

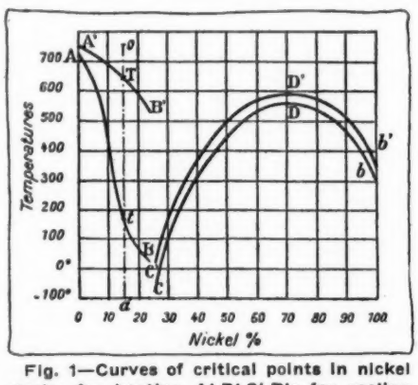


Fig. 1—Curves of critical points in nickel steels; for heating A' B' C' D'; for cooling A B C D

atures the structure which is stable for ordinary steels at high temperatures. This is the situation with steels high in nickel and manganese.

If, however, *t* lies somewhat higher, as at 200 or 300 degrees, and the metal has been heated to above T and is left to itself, it should change back to normal from the high-temperature structure upon reaching *t*, but at this relatively low temperature the molecules have small mobility and the components remain very much divided in their colloidal state; the structure is then that of ordinary hardened metal, combining properties of both the heated and the cold conditions and characterized structurally by fine martensitic needles; or by osmondite flakes which color easily.

In other words, alloys so composed that T comes high but *t* at a temperature at which the metal stiffens considerably can be hardened by heating them to above T and then leaving them alone. It is an obvious objection that such metals must have been heated above T in their manufacturing processes —the smelting, forging or rolling—and therefore must be too hard to be worked. But it has been found, empirically, that alloys of this nature can be softened by reheating them as closely to T as practicable without danger of reaching this temperature—in practice to T minus 25 degrees centigrade—by which operation they lose some of the mechanical effects of hardening while retaining the structural peculiarities and the ability to return to the hardened state when the temperature is again reduced.

Metals of this description, in which *t* lies at about 300 degrees and T usually 400 to 500 degrees higher, are thus of great industrial value in all cases where their physical properties in the hardened state are those desired, the heat treatment being much simplified. They should not be confounded with high-speed steels which follow different laws. In certain chrome-nickel steels the self-hardening principle finds important applications subsequently referred to.

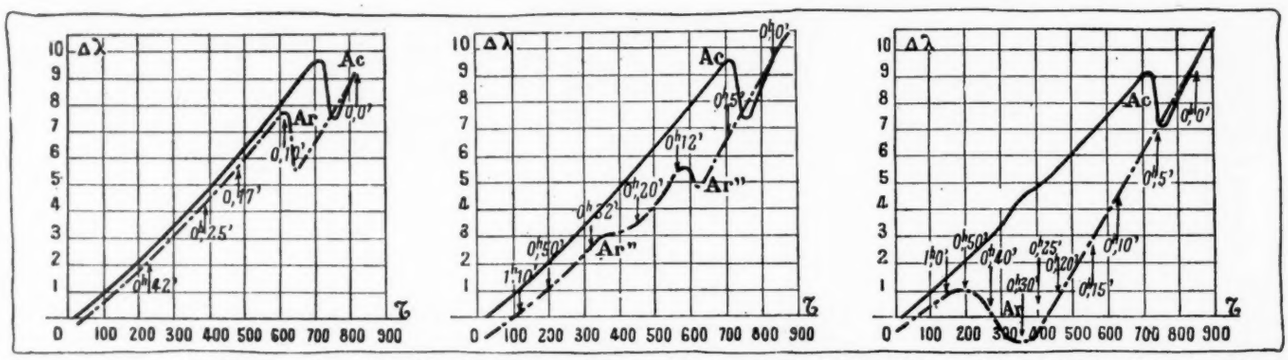
Irreversible by Overheating

The influence upon the hysteresis of the temperature to which the heating is carried has been known for some years, especially so far as chrome-nickel steels are concerned, and is illustrated in Figs. 2, 3 and 4. [These diagrams are based on measurements of the expansion of the steel; Mr. Guillet shows also others based on heat measurements and thermo-magnetic recordings]. It is noticed that the heat reached is about 800 degrees in Fig. 2, 870 in Fig. 3 and 900 in Fig. 4. The rate of cooling is indicated in minutes elapsed. By noting the locations of the points of transformation it is observed that this point, Ac, for the heating curve remains approximately constant but that, for a constant rate of cooling, the critical point Ar of the cooling curve drops considerably lower where the temperature has been higher. Moreover, this point, Ar, repeats itself in two places still lower, Ar′ and Ar″, if the heating has been such as to produce this result, as in Fig. 3. By increasing the heat still further, Ar′ disappears and Ar″ alone remains, and the metal becomes irreversible or almost so. [This seems to mean that reheating to just above Ac does not restore Ar readily to its previous place.] According to statements from the steel works at Imphy, where these diagrams were produced, certain chrome-nickel steels can be made semi-reversible or altogether irreversible according to peculiarities in the heating. The same phenomenon has been turned to practical account in the case of certain copper-zinc brasses.

Some aluminum alloys, when cooled suddenly at certain temperatures, show no immediate changes in their properties, but after some time has elapsed their hardness increases, and for this peculiarity no explanation has yet been vouchsafed.

Self-Hardening Chrome-Nickel Alloys

The industrial steels which are self-hardening by reason of a large hysteresis depending upon their composition contain nickel, but if this alloy metal is used alone to produce the self-hardening property, the strength and the hardness after tempering [which, it is noticed, is a process similar to annealing of ordinary steels] are not sufficient for such industrial purposes as would economically justify the use of a special and high-priced steel. When chromium is also added, however, the result becomes quite different, and it is for this reason that self-hardening chrome-nickel steels lately have entered widely among those used for automobile construction.



Figs. 2, 3 and 4—Variations in the critical transformation points of certain chrome-nickel steels, as determined by the temperatures reached in heating the metal

The physical properties shown by the best known brands of these steels are of interest.

One of them claims separate attention, being among those developed most recently and combining the qualities of the best steels in the two classes mentioned afterwards. It contains: C = 0.28, Mn = 0.32, Si = 0.19, Ni = 5.67 and Cr. = 1.05. Its critical point lies at 725 degrees on the heating curve and at 390 degrees for cooling. Annealed at 650 degrees this steel gives an ultimate tensile strength R = 94.1 kilograms per square millimeter, an elongation A = 14.7 per cent., a reduction of area S = 53.5 per cent. Shocks lengthwise of fiber with the ramming machine registers 10.9, crosswise shock 6.9, the hardness 264 Brinell.

Heated to 850 degrees and self-hardened it gives the following properties: R = 186.3, A = 7.5, S = 29.3, lengthwise shock 5.6, crosswise shock 2.7, hardness 482.

The shock tests were made on test pieces of 10-millimeter square section with notches 2 x 2 millimeters, and the figures refer to the resilience, giving the number of kilogram-meters absorbed in the test piece per square centimeter of working section. The Brinell figures refer to 300 kilogram pressures.

The other self-hardening steels in actual use come in two classes. In the first one the carbon ranges from 0.20 to 0.30 per cent., the nickel from 3 to 5 per cent. and the chromium from 1 to 2 per cent. In the second class the carbon ranges from 0.10 to 0.20 per cent., the nickel from 6 to 7 per cent. and the chromium from traces to 2 per cent. [Guillet here gives tables with the test figures in full for 5 steels in the

first class and 3 in the second, but the general remarks on the showing made in these tables may here be sufficient.] In both classes the high critical point averages about 820 degrees and the low one about 410. The first class shows the higher tensile strengths, elastic limits and hardness, and the second class the higher resilience, especially for lengthwise shocks. High manganese and little chromium in one of the steels in the second class, with the nickel 6.45, produces brittleness however, as it takes this brand into the manganese steel class.

Practical Uses

In accordance with this showing the steels of the first class are indicated for gears and those of the second for rods, steering knuckles and parts similarly subject to brutal shocks. In practice it has been found that none of these steels fail by reason of brittleness, as their high elastic limits —reaching up toward 185 kilograms per square millimeter— are supplemented by a resilience of 4 to 5 kilogram-meters in their hardened condition. It might rather be said that they suffer from a certain lack of superficial hardness when used for gears. They have not always borne out the test figures, but this has been ascribed to faulty gear cutting or mounting of the gears, while it has also been maintained that gears properly machined from the start polish and harden themselves on the wearing surfaces by use, acquiring properties superior to those possessed by them when new.

However this may be, these steels have one important shortcoming in their high price, and this is due not so much to the nickel and chromium contents as to the great care which must be taken in their manufacture, or, more correctly, in their selection. Every melt, every ingot must be studiously investigated and must go to the discard whenever it shows even minor variations in its composition from the standard required in each case.

With regard to the relative effects of chromium and nickel in producing the self-hardening properties, the greater or lesser responsiveness of the alloy under the variations of temperature and the shadings of the final properties of interest to the steel worker or the buyer of the industrial products, Mr. Guillet sets forth a series of conclusions, apparently of great interest to steel makers, and also the chemical industries. It is brought out, for example, that the second class, above mentioned, of self-hardening nickel-chrome steels blends into a third class, in which a portion of the chromium fails to go into metallic solution and forms into carbide, with the peculiar result that the steel becomes highly refractory to ammonia and nitric acid.

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Example of Four-Wheel Drive Truck Used for War Purposes—Rules Governing the Requirements

AT the military trials of subsidized French motor trucks, which had almost come to a close when the European war began, the vehicles in which all four wheels are driven played a conspicuous part, as it had become realized that they would be found almost indispensable for heavy transportation work that could not take place on hard macadamized roads. Three hundred four-wheel drive trucks are now said to have been taken into use in the actual warfare and to have justified the expectations entertained with regard to them, so far as their ability to overcome all sorts of traction difficulties is concerned, while little has become known with regard to the amount of maintenance work required for keeping their special transmission mechanisms in working order under the unusually severe conditions, the very hardest work, across soft fields and ditches and over the steepest grades, being their constant lot.

Some details of the design of the Blum-Latil trucks, which came through the preceding trials with flying colors, are under these circumstances of interest. They are taken, together with the illustrations, from an ante-bellum issue of *Omnia*.

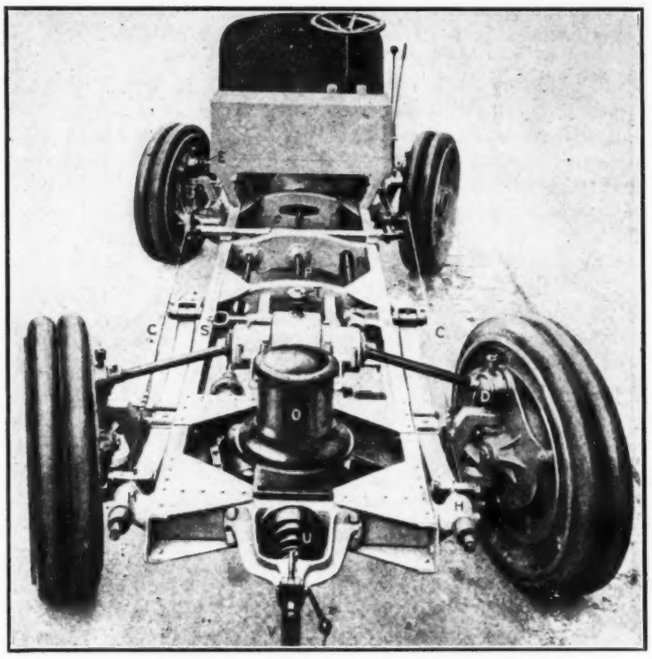


Fig. 5—View from rear of Blum-Latil tractor-truck

An advantage in the all-wheel drive system which has rarely been mentioned is here at once noted—see Fig. 6. As the front wheels are driven they can be loaded more heavily than in ordinary trucks without endangering the steering, and the motor can therefore be placed entirely ahead of the front axle, leaving more loading space for a given length of wheelbase.

The actuating of the front driving axle is much simplified by the same disposition, as it becomes possible to accomplish it, as is here done, by means of a short transverse shaft directly from the gearbox, the latter being mounted, by the way, as a unit with the motor. The rear axle is driven by a shaft from the gearbox in the customary manner.

Each axle has its differential, but that of the front axle is located inside of the gearbox. All of the wheels have speed-reducing gears driven through transverse wheelshaft with universals, and as the vehicle is broad-gauge the wear of the universals is considerably reduced, as compared with a similar driving system for pleasure cars. Both differentials can be locked, to help in overcoming traction difficulties on slippery ground.

All four wheels are steered, and it may be noted in the illustrations that the shaft which transmits the steering effort to the rear wheel pivots are of very large dimensions to secure the rigidity and freedom from torsion which are necessary to make the four wheels turn in perfect unison. There are also brakes on all four wheels and they are actuated simultaneously from the same hand lever by means of two cables, one to each pair of wheels and each with a compensating lever. Like the wheelshafts, the brakeshafts connect with universals mounted in vertical alignment with the axes of the steering pivots.

A special feature in the spring suspension is the lengthwise journaling of the spring shackle housings—or the pins, as the case may be—in the spring brackets, with additional resistance springs in the latter; this provision obviating the torsion of springs when only one of a pair of wheels is raised over an obstacle. Other construction details, such as those relating to the winch and the hooks for the attachment of a trailer, will be noticed in the illustrations.

The rules under which four-wheel-drive trucks are built for military uses in France express of course the opinions

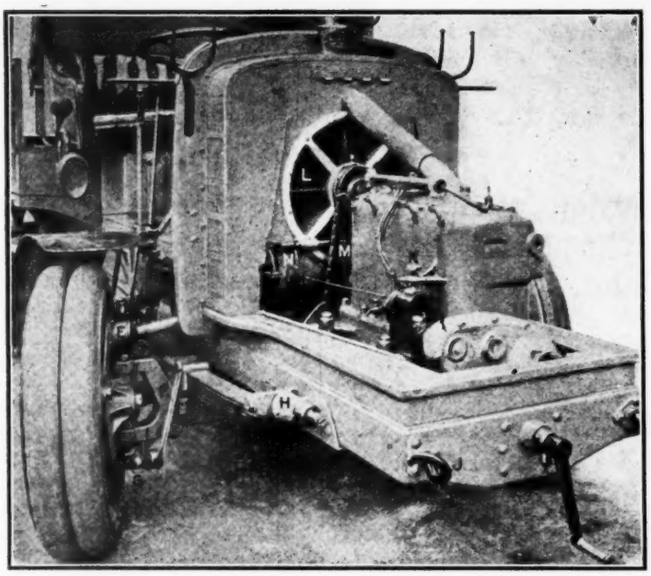


Fig. 6—Over-reaching front end of Blum-Latil truck. F, brake levers; H, pivotal spring brackets; K, set-screw for mounting magneto

which prevailed before the present war enlarged all previously gained experience on such subjects, and these opinions may have been modified on more than one point, but they still have a general value, and the more important ones among them are given in the following.

For emergency transportation work, of a civilian character, such as that which is required in connection with excavating and mining, they might be found even more useful than for the military work for which they were drafted, provided it is considered that the four-wheel-drive system, as applied to business purposes, can justify its constructive complications in other vehicles than those of the electric or gas-electric types.

Regulations for Four-Wheel-Drive Trucks

Weight Limit.—Must carry a payload of at least 1,500 kilograms, and the payload must be at least one-half of the weight of the empty vehicle. No axle must be loaded with more than 60 per cent. of the total, whether vehicle is loaded or empty, and under no circumstances with more than 4,750 kilograms. Maximum weight of vehicle and load 8,000 kilograms.

Traction Efficiency.—Empty the vehicle must be able to haul a trailer weighing twice as much, with its load.

Body.—Driver's seat must be sheltered and there must be seats for two beside it. Body at least 3 meters long, 1 1-2 meter broad with sideboards at least 60 centimeters high.

Turning Radius.—Diameter of smallest turning circle, measured to outside tracks, not to exceed 15 meters.

Wheels.—Front and rear wheels alike, with twin solid and continuous rubber tires (or equivalent substance) on smooth turned metallic rims either 850.6 millimeters or 1 meter in diameter.

Brakes.—Two sets required, one acting on transmission, the other on wheels; one operated by hand, the other by pedal.

Gear Speeds.—At least four and reverse. Low speed must develop at least two-fifths of the total loaded weight in pull at the hauling hooks, on good and level roads.

Devices Required.—It must be possible to lock the differentials. There must be two hooks at the front as well as at the rear of the frame, so that vehicle can both haul and be hauled. They must endure a pull of 2,000 kilograms and be suited to have cordage 40 millimeters thick looped into them. At the rear there must also be a spring hook, artillery model. A sand box to be operated by the driver from seat. A winch or similar device actuated from motor by irreversible gear and admitting of ready removal of cable, whether latter is under pull or not. Arrangements for pulling forward as well as rearward.

Cooling Capacity.—Sufficient to permit stationary operation for 30 minutes with power needed for hauling loaded trailers.

Hill-Climbing.—With maximum own load 18 per cent. grades; with trailer load in addition 12 per cent. grades on hard roads. By winch the trailer load on 15 per cent. grades.

Brake Capacity.—Sufficient to stop with trailer on 10 per cent. grade without recourse to brakes of trailer. Sufficient to anchor vehicle on 15 per cent. grade and haul trailer load by winch.

Rules for All Trucks

A number of the regulations are the same as for ordinary motor trucks with the ordinary driving system, while there are also many rules for the ordinary trucks which do not apply to the special class. All rules are of course at present somewhat relaxed. The rules in common are:

Anti-Skidding.—Means for easy attachment of traction chains or equivalent devices; they must not project beyond the rim of wheel and must keep coils of chain separate and evenly spaced.

Total Width.—Of vehicle, must not exceed 2.20 meters.

Road Clearance.—All organs must be at least 30 centimeters above the ground when vehicle is loaded. The wheels and organs thereon form exceptions.

Screwthreads.—Bolts, nuts and threaded pins must follow international system, if the parts serve for the assembling of two pieces, but not if they serve for adjustments.

Radiator Protection.—Radiators must be effectively armored by strong screens against accidental collisions.

Sprags or equivalent devices are compulsory. The construction and manner of mounting *magnetos* are hedged with many detailed provisions looking to interchangeability.

A *mirror* for looking backward must be provided, or an equivalent device. Also suitable tool *boxes* or *drawers* and one or more boxes to receive the baggage of three men, totaling an interior volume of at least 100 cubic centimeters. No box must have any dimension less than 0.20 meter.

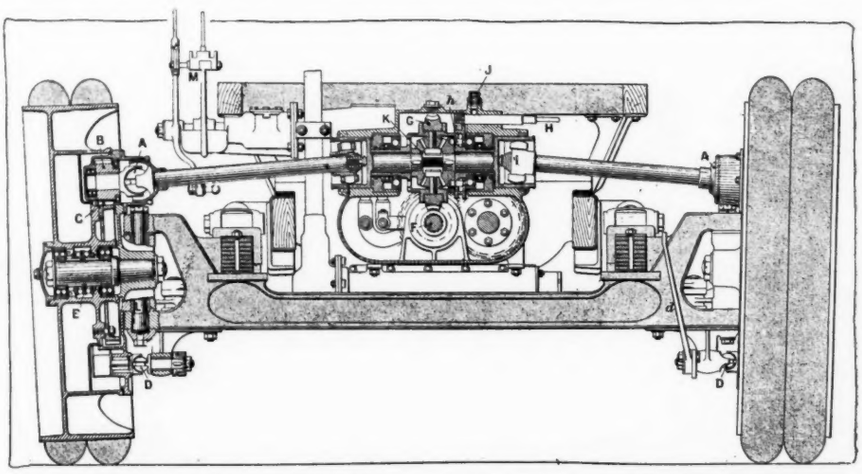


Fig. 7—Section of transmission; similar in front and rear. A, universal; BC, reduction gear; D, universal for brake; F, longitudinal drive shaft; G, worm gear for winch drive; H, lever for locking differentials with lugs *h*; K, differential; M, gear lever and quadrant

Care of Truck Springs

Overloading and Overspeeding Injurious to Suspension—Loading Problems — Resetting Worn-Out Springs Not Economical—Clips Must Be Kept Tight and Inspected Each Week

By John G. Utz,
Perfection Spring Co.

EDITOR'S NOTE—*A paper read by John G. Utz of the Perfection Spring Co., Cleveland, O., before the convention held in Detroit, Mich., under the auspices of the Motor Truck Club of America, October 7-10.*

SPRINGS are probably called upon to stand more grief and punishment than any other part of a heavy-duty truck. The variation from no load to full load is so much greater than on a pleasure vehicle that it is worthy of attention.

Assume a 3-ton truck to weigh 8,000 pounds, or 4 tons, above the springs. When loaded a strain of 7 tons is upon the springs against 4 tons empty, a gain of 75 per cent.

A pleasure vehicle weighing 2 tons is only asked to take an additional passenger weight of 1,200 pounds, or a gain of 30 per cent. These figures indicate that the truck springs must handle close to two and one-half times the variation of a seven-passenger pleasure vehicle.

Use Rating Plate

This comparison of weight increase, due to carried load, refers to normal rated load only. In cases where overloading is practised it is evident that the gain is greater and, consequently, the springs are called upon to handle even greater variations. In most cases truck makers are attaching the rating plate in a prominent place, cautioning against loading beyond rated capacity, but we all know how these rating plates are disregarded.

Again, some truck makers allow for an overload capacity in their design beyond the advertised rated capacity, and when the spring maker is advised of such conditions, he is able to accommodate the same in the spring design.

Misleading Capacity

There is danger in letting it become generally known that a given truck is capable of handling a certain over-load, as many truck salesmen, in order to clinch a sale, will tell the prospective customer that, while the normal rating is, say 3 tons, "the truck is really designed to carry 5 tons." This is unfair to all concerned, as the customer immediately considers the vehicle as having a 5-ton capacity, and will load up accordingly, occasionally even exceeding this limit. The result is self-evident; all margin of safety disappears and the ultimate life of all parts is shortened accordingly.

The next item is the solid tire of the truck that throws additional vibration upon the springs. The frame of a truck is far more rigid than that of a passenger vehicle, which throws the distortion, due to road variations, upon the springs of the trucks.

Distribution of Load

Next, and of great importance, is the determination of load. In a pleasure vehicle the position of the carried load is predetermined, but on a truck the placing of the load is entirely up to the discretion of the driver.

The relation between bulk and weight of goods transported is widely variable, sometimes even in the same load. The necessity of evenly distributing such a load in proportion to weight instead of volume is a point that must be observed.

Quite often there is a temptation to place a heavy casting or piece of machinery on the very rear of the platform. A little thought and analysis will show that such loading throws a complex set of strains upon the springs that cannot but be harmful. Such a load should be placed in the middle of the platform right and left and as well as possible fore and aft.

The front end of a conventional truck has more or less constant load. At all events 80 per cent. of the load falls on the rear springs. It follows that the variable loading at the front end cannot be greater than the ratio of the load, reduced to pounds, to the weight of the motor equipment, cab, driver and helper.

Driver's Judgment Needed

Referring to the rear springs, since they carry 80 per cent. of the total load and, remembering that the load varies from nothing to as much as 50 per cent. overload, nothing but the intelligence of the driver stands between good and bad spring service.

Where Load Shifts

Another point of considerable importance in heavy duty trucks is the possibility of loads shifting, due to crowned roads. Many commodities, such as brick, small heavy castings, stone, etc., are given to shifting to the right side of the loading platform when driving on the right side of a crowned pavement. It is apparent that when a truck hauls nothing, for instance, but brick, and is continually driven on the right side of the road, the shifting of the load to the right side of the platform throws a more severe strain on the right spring than on the left, and it is quite apparent that the right spring will consequently fatigue long before the left spring. This may seem like a fine drawn theory, but there is definite knowledge of quite a number of cases where this very thing has occurred. Attention has also been called to certain vehicles, which, under full load, were standing lower on the right side than on the left. In these cases it was found that the load had shifted to the right and the truck was also standing on the right side of a crowned road, and difference as much as 2 inches or 3 inches between the two springs have been noted in such cases.

The Injury of Speeding

Speeding is probably the greatest crime that can be perpetrated upon an innocent truck. If a truck is moved along the road at 10 miles per hour under full load, it is more than likely that it will continue to do so for a very long time without exhibiting undue weakness at any point. But, if a truck is driven without any load at 20 miles per hour, remembering that the truck weighs more or less than 60 per cent. of the gross rated load, it is a certainty that the truck will wear out long before it pays for itself in service. It is not believed that the average driver fully understands how detrimental it is to the life of a truck to drive it at high speed when it is empty. The energy stored in a moving mass responds to the rule,

which may for convenience be expressed as follows:

The energy stored in a moving mass is proportional to the weight in pounds multiplied by the square of the speed. In other words, if the speed is doubled, the strain is multiplied by four, and the life of all parts materially diminished.

Buy by Weight

In the economical production of commercial vehicles, in view of the present day competition, truck makers are reducing costs wherever possible, and since springs are sold by the pound, they are quite anxious to reduce the weight of the springs.

Springs Dissipate Energy

There is a point here worthy of attention. In the first place, the springs are called upon to absorb and dissipate energy, and there are only two ways in which this energy can be absorbed and dissipated, and both ways are in the form of friction. The two kinds of friction involved are internal and external, the internal being work done upon the molecular structure of the steel and the external in friction between the plates. The external friction is small, and with the present unwarranted demand for lubrication between spring plates, little reliance can be placed upon this form of absorption. This leaves the internal friction of the molecules as the only means of absorbing the desired energy. The more energy the molecular structure of steel is called upon to absorb, the sooner its power of absorption will be overcome. Therefore, it is quite evident that the larger volume of steel employed to absorb this energy, the greater will be the life of the springs. It is surely true that a certain amount of energy must be absorbed in the springs, and the more steel the more life. Hence, a reduction of steel means a reduction of life.

The Safety Factor

It also follows, where the springs are designed with sufficient steel to absorb the energy brought about by the normal rated load with a liberal factor of safety for overload; that, when the normal load is exceeded up to the overload, the factor of safety disappears; and when the carried load exceeds the overload capacity, the life of the springs will be reduced at an alarming rate.

Springs Wear Out

It should be borne in mind at this time that springs and tires are the two things on any motor vehicle which must wear out, since they are the only two items on a vehicle that are deliberately distorted in normal service. Fortunately for the truck maker (and unfortunately for the spring maker) springs do not wear out in as short a time as tires, but they ultimately must wear out. And when springs that have stood up to the mark for a considerable time begin to weaken and settle, it is time to replace the entire spring instead of having them reset.

Opposes Resetting

Resetting of springs is something like retreading a pneumatic tire, or putting a pair of half soles on an old pair of shoes. It is not economy to put a pair of half soles on an old pair of shoes where the uppers are practically worn out. We all know that retreading an old pneumatic tire is of little value as the carcass is near the end of its life; and for the same reason it is not good policy to reset an old pair of springs, as the molecular tension of the steel indicates that it is near exhaustion when the springs begin to settle, assuming the steel to be of corbitic micro-structure after heat treatment.

Keep Clips Tight

Spring clips should be inspected at least once a week and tightened as much as possible. If the clips become loose, the spring will break between the clips. If there is undue stretching of the clips, the difficulty might be overcome by having new clips made of better material, as it is always cheaper to replace clips which are too light than to have broken springs as a result.

The bearing place upon which the spring rests on the axle should absolutely conform to the curvature of the spring at that point, as sufficient bearing surface is just as important as tight spring clips.

Hints on Repairs

If a spring plate should break, it is important to have it repaired or replaced immediately by a skilled spring maker. Quite often a break in a plate occurs at a place where it does not immediately cripple the entire spring, but it is simple to understand that the breaking of one plate throws extra work upon the other plates which will break in turn. If one of the intermediate plates should break at the center bolt, the spring clips should be tightened down until it is possible to have the break repaired. Very often rebound clips are loose and broken. Missing rebound clips very often result in broken main plates.

On chain drive trucks there is always an ample allowance for adjustment to offset the stretch and wear of the chains. As the chains become stretched to a great extent, it is wise to remove an entire link and then shorten the adjustment so as to keep the spring shackles (at each end of the spring) standing at about the same angle.

A spring is a complete unit as produced by the spring maker. The removal or addition of a plate entirely disarranges the grading of the original plates, and should never be practised under any circumstances. It is also very bad policy to replace a broken plate by any plate that happens to be of the same width as the spring. It is far more desirable to let a competent spring maker attend to the repair or replacement.

In view of the preceding, there follows a list of things to be observed in the operation and care of the truck, if there is a desire to give the springs a fair chance to offer their longest life.

Rules of Reason

A—Evenly distribute load. Prevent shifting of load.

B—Do not overload beyond rated capacity. The factor of safety allowed by the maker is for the owner's protection as well as the maker's.

C—A wheel out of round due to flat spots on a solid tire, imposes a severe and dangerous shock upon the springs. Keep the wheels round.

D—Keep excessive side play out of shackles and hangers to minimize the lateral shock on the springs when on rough roads.

E—Give careful attention to all parts subject to friction. Keep them amply lubricated, as an excess of grease keeps the dirt out.

F—Take corners slowly, without or with load.

G—Back into a curbstone or platform gently as your radius rods might buckle and throw the jolt upon the springs. In driving the front wheels against a curb or any obstructions, the shock must be taken by the springs alone.

H—When loaded, drive gently over rough road or obstruction, remembering your frame is rigid and the springs must take the distortion.

I—Drive at moderate speeds at all times. Remember your solid tires have little resiliency.

J—If you have to tow a car, or have your car towed, hitch the tow-rope to the frame, not to the axle.

K—If an accident occurs, and a spring hanger, or the frame near the hanger is bent, have it straightened at once. A spring distorted by a bent hanger is liable to break under load.

L—When adjusting chains, remove a link when the adjustment would throw the shackles to a bad angle.

M—Keep spring clips tight at all times. If a center bolt should break, due to loose clips, replace it at once.

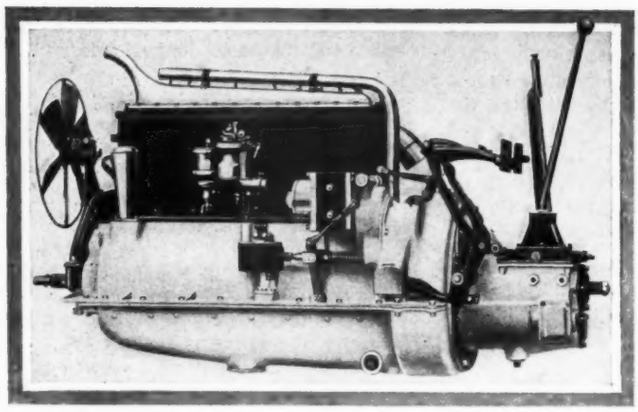
N—On a crowned road, drive as nearly in the center as possible, as driving to the right throws an extra load on the right-hand spring.

O—If a plate breaks, have it repaired by a competent spring maker at once, or the other plates will break in turn.

P—Tighten or replace loose or broken rebound clips.

Kissel Adds L-Head Block Six

New Model Has 3 5-8 by 5 1-2-Inch Motor—Electric Starting and Lighting and Vacuum Fuel Feed—Many Body Types

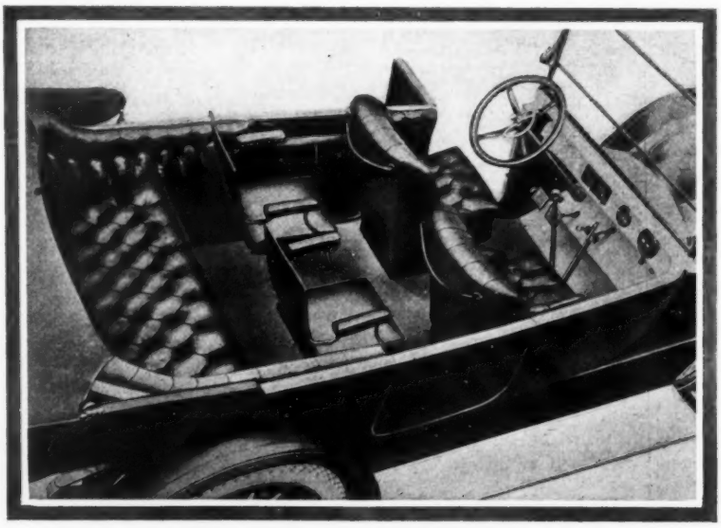


Left side of power plant used in new Kissel 42-six. The motor has a bore of 3 5-8 inches and a stroke of 5 1-2. Valves are 2 3-16 inches in diameter with heads of nickel steel

AS the result of over a year's work in preparation and testing, the Kissel Motor Car Co., Hartford, Wis., has brought out a six-cylinder model embodying L-head block motor, three-speed gearset, 126-inch wheelbase, electric starting and lighting and complete equipment. This addition to the company's line lists at $1,650 fitted with five-passenger touring body with either two or four doors, or as a roadster. With seven-passenger body having three or four doors and oversize tires the car sells for $1,850, while with five-passenger touring body including detachable sedan top it is $2,000 and in coupelet form, $1,950.

The Motor

An L-head motor is used in the new model, which is called the 42-six, and the cylinders are cast in a block. The bore is 3 5-8 inches and the stroke is 5 1-2, giving an S. A. E. rating of 31.57 horsepower. The makers' rating, based on block performance, is 42 horsepower. Valves are 2 3-16 inches in diameter and are inclosed, together with the lifters. Valve heads are of nickel steel. The crankcase is an aluminum casting and, to insure maximum strength, the division is 2 inches below the crankshaft, which measures 38 1-4 inches over-all. The crankshaft is of special alloy steel and is carried on bearings 2 1-8 inches in diameter. The camshaft is of heat-treated alloy steel and is driven by wide-faced helical gears and is supported on white brass bearings.



New Kissel model 42-six fitted with special seven-passenger tonneau

The gray-iron engine cylinders are sand blasted and milled on a special machine, all holes being bored at the same time to insure accuracy and interchangeability. The heat treatment of the various metals used is all done in the Kissel plant, which is equipped with oil furnaces, dip tanks and electric pyrometers for this work. All chassis are tested by fan dynamometer.

Vacuum Fuel Feed

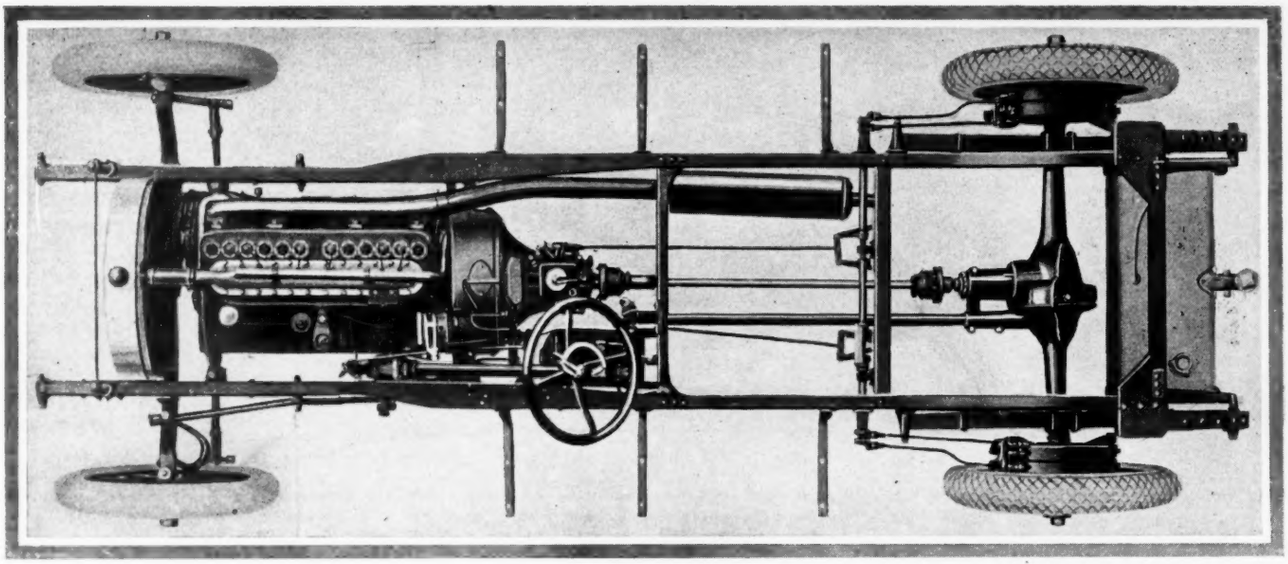
The lubrication system is by splash with a constant oil level maintained in troughs under the connecting-rods by a pump, whence it drains through a screen before being redistributed. The cooling water is circulated by pump through a Mayo honeycomb radiator through which a draft is induced by a 16-inch safety blade fan. The carbureter, which is a Stromberg of special design, is mounted horizontally and attached directly to the cylinders near the top, thus promoting accessibility. Fuel is fed from a 19-gallon main tank mounted at the rear of the chassis through a Stewart-Warner vacuum feed apparatus. The electric starter bears the Kissel nameplate and operates through gearing cut in the periphery of the flywheel, a foot plunger serving to engage the gears and connect the starter with the Willard battery, which is located amidships, under the floor. All wiring is centralized in a panel in front of the dash, thus facilitating the location of trouble and permitting the removal of the body without severing any wires in the electric system. The lighting generator is driven by gear from the engine. Headlights are provided with a dimming attachment.

Vanadium Steel Axles

From the motor, power is transmitted by a leather faced cone clutch, with adjustable spring inserts, to a three-speed selective gearset, the motor, clutch and gearset forming a unit supported on one bearing at either side and one bearing in front. Annular ball bearings are used throughout the gearset. The axle is of the floating type with vanadium steel driveshafts mounted, with the chrome-vanadium steel differential on Timken roller bearings. The differential gears are steel forgings, case hardened. The front axle is an I-beam section with vanadium steel steering knuckles and arms properly heat-treated.

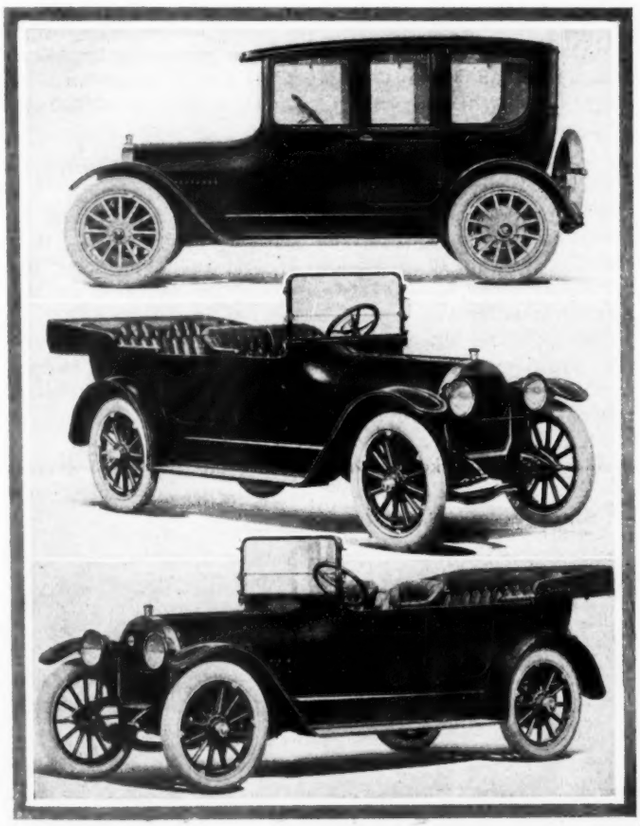
Easy Brake Adjustment

The pressed steel frame is arched at the front to give maximum clearance and permit of a short turning radius. It is mounted in front on semi-elliptic springs, 2 inches wide, and in the rear on three-quarter el-



Plan view of Kissel 42-six chassis, showing block motor, mounting of electric starting and lighting units and main fuel tank at rear. The speedometer is driven from the rear of the gearbox

liptics 2 1-4 inches wide. Both sets of brakes are external contracting on 14 by 2-inch drums mounted on the rear wheels. There is a hand nut arrangement for easy adjustment. With the exception of the seven-passenger model, which is mounted on 35 by 4 1-2-inch tires, all models are shod with 34 by 4 tires, the wheels being second growth hickory with heavy spokes.



Upper—Detachable sedan top fitted to regular touring body on Kissel 42-six chassis. This combination sells for $2,000 and furnishes an admirable all-weather car

Middle—The four-door five-passenger touring body which lists at $1,650 mounted on the new six-cylinder chassis

Lower—With one-compartment touring body having two doors and carrying five passengers, the 42-six sells at $1,650

As usual, the company has made a strong feature of body design, the new models, which are all products of the Kissel shops, being true adaptions of the streamline principle. Body walls are of special sheet steel, with aluminum backs, covered with the best grade of leather, the cushions which are 11 inches deep, incorporating mattress springs and fine curled hair. The storage facilities are unusually ample, the compartment under the rear seat measuring 43 by 15 1-2 inches. Tools are stored under the front seats, the space being almost equally ample. The standard color is Kissel blue with a gold hairline striping finished with English varnish. All control instruments are mounted in a straight line on the dash, where they are illuminated by concealed electric bulbs. Fenders are crowned.

Left Drive and Center Control

Steering is on the left, an 18-inch wheel with inserted spider operating a split nut and worm fitted with adjustable ball thrust bearings. This arrangement is semi-irreversible. Control levers are in the center on the driver's right.

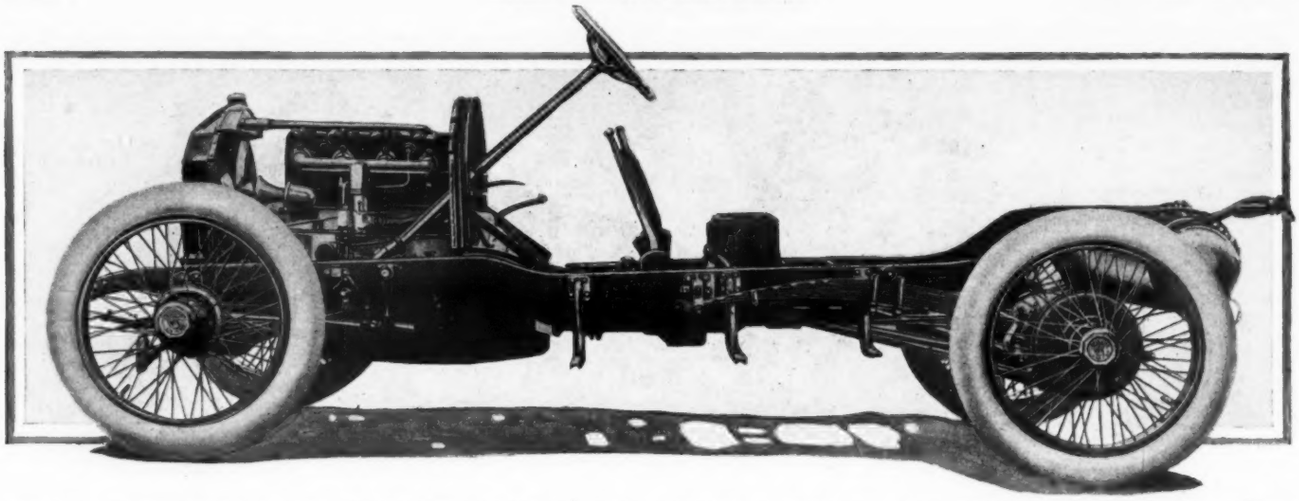
The equipment, which is included in the list price, includes a two-piece ventilating rain-vision windshield, one-person top with cover, demountable rims, Stewart speedometer driven by a gear from the rear of the gearbox, ignition lock, motor-driven warning signal, adjustable tire carriers and the usual jack, tools, foot and robe rails and tire repair outfit.

In addition to this new model, the Kissel company is continuing all its other models as follows: 60-Six, $3,150; 48-Six, $2,350; and 36-Four, $1,450.

B. S. A. Profits for Year $952,150

LONDON, ENG., Dec. 1—The annual statement of the Birmingham Small Arms Co., Ltd., also known as the B. S. A., the largest motor concern in England is always awaited by the British automobile trade with much interest, because, since the old Birmingham manufacturers have taken over the British Daimler works it has become one of the leading automobile manufacturing concerns not only on British soil but of Europe.

The fiscal year ending in 1914 shows a total profit of $952,150 equal to about 12.7 per cent. of the capital stock of the concern which is $7,500,000. A dividend of 15 per cent. has been declared, which with the exception of 3 years, is the same the concern has declared during the last 13 years. A quarter of a million dollars has been placed on reserve and $341,420 has been carried forward.



Side view of four-cylinder chassis of 1915 Willys-Knight, showing mounting of motor with its detachable cylinder heads, cantilever rear springs, left drive and center control, and also of horn and storage battery

Refinements Mark New Willys-Knight

Chassis Changes Include Addition of Tire Pump, New Carbureter and Use of Ball Bearings in Gearbox

THE most important change noted in the 1915 Willys-Knight made by the Garford Co., Elyria, O., is the reduction of the price from $2,750 to $2,475. The mechanical changes that distinguish the new model are in the details, the body lines have been improved, a four-cylinder, motor-driven pump has been installed, a Zenith carbureter added and ball bearings substituted for rollers in the gearset and rear axle.

Removable Cylinder Heads

Dimensions of the four-cylinder motor remain at 4 by 5.5 inches, giving a rating of 40-45 horsepower. The cylinder heads are removable and the return connections to the radiator are attached to the heads. The intake manifold is a simple T design. The carbureter is carried high on the left side of the motor so that the manifold is very short and the possibility of condensation negligible. A hot air pipe is fitted. Also on this side of the motor is the oil filler opening which is situated in the front arm of the crankcase and the oil gauge which is located in the rear motor arm.

On the right side of the motor are found the centrifugal water pump, tire pump and Simms magneto. The pump is placed at the front and the magneto to the rear, the latter being driven directly from the pump shaft. Between these two units is a gear which meshes with an idler driving the tire pump.

Force-Feed Oiling

The crankshaft is carried on five plain bearings and the eccentric shaft which drives the sleeves is mounted on three bearings. Oil is distributed to all the bearings by a force feed controlled by the throttle. A gauge on the cowl shows the pressure maintained in the system at all times.

The starting and lighting generator is a single unit U. S. L. system combined with the flywheel. Starting current is furnished by a 24-volt, 80-ampere hour storage battery mounted under the front seat. The generator is completely housed in a bell extension of the crankcase.

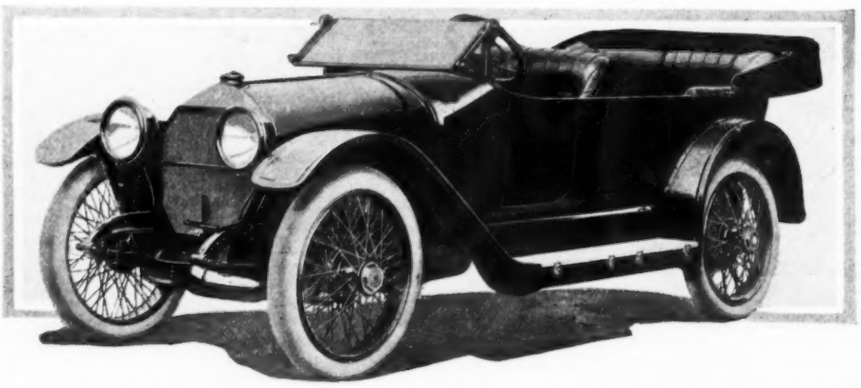
Power is transmitted from the motor to the gearset by a leather faced cone clutch with springs under the leather to insure easy and gradual engagement and a clutch brake to slow the clutch down when disengaged and thus facilitate gear changing.

Four-Speed Gearset

The gearset is a four-speed unit mounted amidships. Direct drive is on third. The gears have wide faces, it is stated, and are made from heat-treated vanadium steel. As previously noted, the gear shafts are now mounted on ball instead of roller bearings.

The rear axle is a floating type with worm driving gears. The worm is situated under the wheels so that it is continually submerged in oil thus affording maximum lubrication and minimum wear. This construction also gives straight line drive.

Two sets of brakes, both operating on the wheel drums, are provided. The service set are external contracting and the emergency internal expanding.



Willys-Knight five-passenger touring car for 1915, which, with electric starting and lighting system and complete equipment, sells for $2,475

The front axle is an I-beam drop-forging, being made in one heat without welding. Renewable bronze bushings are employed in the steering arms, ball thrust bearings in the steering knuckles and taper roller bearings in the hubs. It is stated that the steering knuckles are so designed that a very short turning radius is allowed.

Lanchester Rear Springs

In the rear, the Lanchester cantilever method of spring suspension is continued. This spring is an inverted semi-elliptic which is fulcrumed at its center to the frame and shackled at its forward end. The rear is carried under the axle where it rests upon a roller, permitting a free backward and forward movement and removing the dead weight of the spring from the rear axle, thus tending to improve the riding qualities of the car and to decrease the wear and tear on the tires.

Since the range of travel of the cantilever spring for a certain up and down movement of the axle is only about one-half the distance in the ordinary half-elliptic, the former moves up and down at a slower speed than the latter and the shocks to which the passengers are submitted are just that much less. The dimensions of the springs are 52 by 2.5 inches.

Semi-elliptic springs are used in front, these measuring 38.5 by 2.25 inches.

Left Drive and Center Control

Left drive with center control is standard. The steering wheel has a diameter of 18 inches and is a worm and full gear type. These parts are hardened steel and adjustable and are equipped with ball thrust bearings.

Turning to the body, it will be noted that the lines have been improved somewhat, giving the car a better streamline form. The body is composed of steel and wood, all hinges are concealed and the latches operate from the inside. The finish is dark blue with ivory striping, and the metal parts are nickel trimmed.

The new body furnishes an abundance of leg room for the tonneau passengers so that with three in the tonneau there is no crowding. The seats are extra wide. High seat backs and deep upholstery add to the comfort. Full Turkish roll cushions are used. The flexible springs in the upholstery are filled with selected curled hair and covered with long, straight-grained hand-buffed leather. The front seats are adjustable, permitting the position best suited to the driver.

New Instrument Board

An instrument board extending across the body under the upper edge of the cowl is a new feature on the Willys-Knight. This brings all of the indicating devices into a position just a trifle below the driver's ordinary line of vision. The electric light switches are also conveniently located and can be reached without effort. The electric horn button is placed at the top of the steering column.

The equipment includes complete electric starting and lighting equipment, one-hand extension mohair top with storm curtains and top boot, windshield of the folding type, inspection lamp, engine driven, four-cylinder power tire pump, speedometer driven from the gearset, electric horn, extra wire wheel and carrier, long tool boxes under the running boards, robe rail, foot rest, tire repair kit, jack and tools. Tires are 36 by 4.5 inches, fitted on quick detachable rims.

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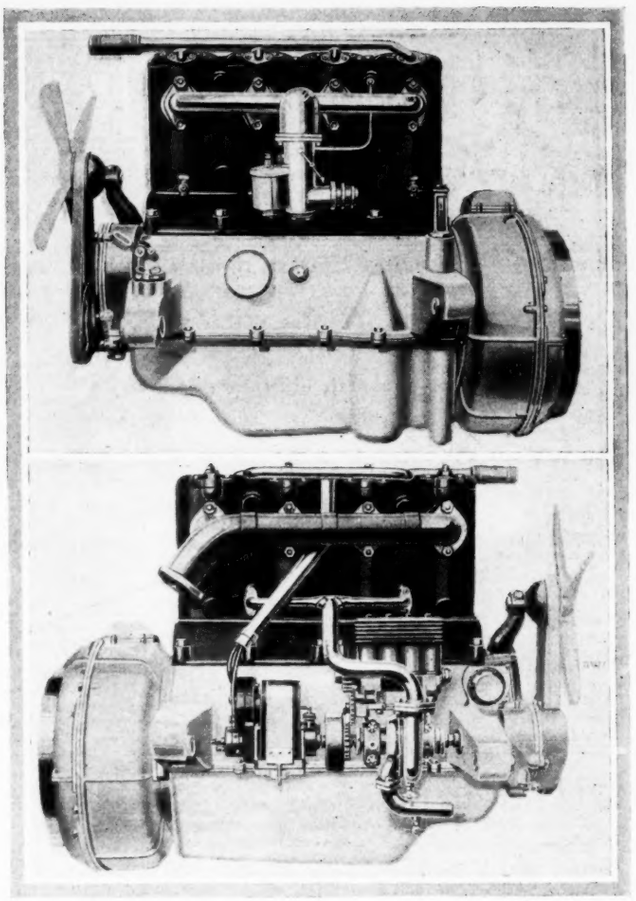
200 Goodyear Family Homes Completed

AKRON, O., Dec. 14—After a year in the making, the plan of the Goodyear Tire & Rubber Co., of this city to provide modern homes for its workmen at actual cost, has made such progress that it is regarded as one of the interesting sights of the city.

Nearly 200 homes have already been completed and occupied and many more applications for homes will be acted upon as soon as the return of spring makes building operations possible.



Upper—Intake side of four-cylinder motor used in Willys-Knight for 1915. Note high mounting of carbureter and housing for USL starting and lighting system

Lower—Exhaust side of motor, showing mounting of new four-cylinder tire pump, centrifugal water pump and Simms magneto. Also note neat method of wiring and strong fan attachment

President F. A. Seiberling, whose idea it was, bought several farms at the edge of town, not far from the works. A design for the community was arranged by an eastern landscape gardener. Streets were laid out in graceful curves, pavements and sidewalks, sewers and gas and water pipes, etc., put in, all on large contracts, and the total cost of the land plus the improvements was divided into actual lot prices, without profit. Then contracts for houses were let in large numbers insuring lowest costs, and the completed properties turned over to workmen and paid for as rent. No down deposits are required.

Individuality in Houses

One of the strongest features of the plan is that every house has individuality. It in no way resembles the usual "company house." Brick, brick and stucco and frame are included in the designs, of which there are dozens—and each has its proportions and style in harmony with the whole plan.

Men who have been prevented from owning homes because of inability to make "down payments," now become home owners. The community already has its church, school and stores.

It is expected that the community, built upon the hills just outside the eastern limits of the city of Akron, will finally contain about a thousand homes.

The Automobile

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New York's Delay

WHAT is wrong with old New York?

Indianapolis built its speedway years ago, thanks to the enterprise of four Hoosier citizens, and has made good. Minneapolis, in the face of a national depression, is building hers for the Northwest. Chicago, where there has been continuous hesitation for the past 3 or 4 years, has at last fallen into line. Sioux City, Iowa, started 2 years ago and has made good. The Pacific coast has corralled everything in the speed record field. Even the South in Texas has made good. But, why New York? Here within a short radius is a population approaching 9,000,000, ample patronage for a flock of speedways. Here in New York, the cradle of automobile racing in America, there is a most noticeable dearth. The coveted Vanderbilt that was conceived and nurtured on Long Island has wandered to the Pacific, where the energetic Californians have taken pity on it. Why New York?

Light Armored Cars

FRANCE, as well as other belligerents, has learned that weight and height are the two big handicaps on armored cars, truly a page taken from standard automobile experience. Too much weight or armor plate consumes the good in the car. The armored car, as with many other devices is largely a compromise, a middle course between the heaviest armor that would withstand bullets and the lighter armor that allows speed and a factor of protection. But in this war speed is often more desirable than over protection, and so France in its latest fleet of armored machines, described in other columns in this paper, has aimed at high possible speed at the expense of over armoring. The wheels are left entirely exposed, as they offer the poorest target—in fact the enemy will generally endeavor to disable the gun. Light weight and speed reduce this possible danger, in that a swiftly moving car offers a much poorer target than a slower moving vehicle.

Ethics of Attack

SINCE 1910 the use of block cast cylinders has increased from 8 to nearly 68 per cent. notwithstanding the usual arguments launched against the practice for years by those who saw to it that their method of casting singly, in pairs or in threes was infinitely superior to the block method. In spite of these continuous charges the block continues to gain, and unquestionably when the figures for 1916 are compiled the percentage will be still higher. How long before some makers will be content to watch new developments take their place in the industry without the usual muck-raking methods, worthy of some crossroad political campaign, being followed by those concerns that do not believe in the new or who for manufacturing or other reasons are compelled to use the older designs for some time. Manufacturing ethics would dictate at least a passive policy, yet the events of the last 5 years reveal several instances of where a maker openly attacked a type of design that he intended to use the following season, but which he thought he was required to attack because it did not coincide with his present methods. How long?

The Boomerang

LITTLE did some unsuspecting maker or salesman imagine when he first gloried in the overcapacity ability of a motor truck that the day would not be far distant when the makers would as a unit have to actively campaign against such destructive practices. It is not 3 years since a big metropolitan buyer made it a requisite of the demonstration that each truck should carry 100 per cent. overload at approximately 50 per cent. over the rated vehicle speed. The fastest performer was given the initial order. Today the tables are turning and our makers are finding it necessary to institute a campaign, one platform of which is to prevent spring makers supplying to owners stronger springs for a truck than those originally fitted, the ostensible object of the owner being to fit stronger springs to care for more overload. Brass-band salesmanship may appear attractive for a single order, but it proves very costly when adopted by the masses.

Exports for 10 Months Ending October Total $21,241,860

20,262 Passenger Cars Valued at $17,888,351 and 1,309 Trucks Worth $3,353,509 Sent to Foreign Countries—Great Britain Is Largest Buyer

WASHINGTON, D. C., Dec. 12—The detailed figures of the imports and exports of automobiles and trucks during October and the 10 months ended October, together with figures for the corresponding periods of last year, were made public today by the federal bureau of statistics. The general figures were published exclusively last week in THE AUTOMOBILE. The figures are of particular interest at this time as showing the influence of the European war on our import and export trade. The complete tabulation appears herewith.

In October 672 commercial cars, valued at $2,286,964, and 732 passenger cars, valued at $768,387, were exported, as against seventy-nine commercial cars, valued at $129,506, and 1,697 passenger cars, valued at $1,663,716, exported in the same month last year. The exports for the 10 months ended October last were 1,309 commercial cars, valued at $3,353,509, and 20,262 passenger cars, valued at $17,888,351. During the same period in 1913, 857 commercial cars, valued at $1,480,646, and 21,872 passenger cars, valued at $21,614,434, were exported.

The imports of passenger cars increased during October. Last year for that month, twenty-nine cars were imported while in October, 1914, thirty-two were brought from the other side. Ten of these were from the United Kingdom, which led all the other countries.

Exports to Non-Contiguous Countries

WASHINGTON, D. C., Dec. 12—Figures have been compiled showing the exports of motor cars and parts to the non-contiguous territories of the United States during October and the 10 months ended October, together with the figures for the corresponding periods of last year. The figures show that in October a year ago three cars, valued at $2,536, and parts, valued at $82, were shipped to Alaska. There were no cars shipped to Alaska in October last and the parts shipments were valued at $321. During the 10 months' period the shipments of cars increased from twenty-six, valued at $24,549, in 1913, to fifty-four cars, valued at $60,703, in 1914, while parts shipments increased from $3,176 to $8,100.

Hawaii Takes 139 Cars in October

Hawaii received 139 cars from this country in October last, the value of which was $120,247, while in October a year ago 29 cars were sent to the islands, the value being $49,083. During the 10 months' period the shipments increased from 496 cars, valued at $861,005, in 1913, to 753, valued at $764,029, in 1914. Parts shipments decreased from $8,172 in October, 1913, to $7,874, in October last, but increased from $76,435 to $79,535 during the 10 months' period.

Shipments of cars to Porto Rico increased from twenty-seven, valued at $31,972, in October, 1913, to thirty-six, valued at $33,275, while parts shipments fell from $5,792 to $5,241.

During the 10 months' period the car shipments increased from 232, valued at $295,703, to 284, valued at $268,632, while parts shipments decreased from $71,895 to $58,358.

During October last 5 cars were shipped to the Philippine Islands, the value of which was $10,790, while in October a year ago the number was 69 and the value $83,474. During the 10 months' period the shipments declined from 550, valued at $687,300, to 360, valued at $371,541. Shipments of parts increased from $7,776 in October, 1913, to $8,768, but decreased from $57,586 to $43,893, during the 10 months' period.

	October				10 months ending October			
	1913		1914		1913		1914	
	Number	Value	Number	Value	Number	Value	Number	Value
EXPORTS								
AUTOMOBILES:								
Commercial	79	$129,506	672	$2,286,964	857	$1,480,646	1,309	$3,353,509
Passenger	1,697	1,663,716	732	678,387	21,872	21,614,434	20,262	17,888,351
Total	1,776	$1,793,222	1,404	$2,965,351	22,729	$23,095,080	21,571	$21,241,860
BY COUNTRIES.								
AUTOMOBILES:								
France	59	$35,759	108	$171,049	714	$546,090	1,152	$796,685
Germany	32	27,923	.....	.....	890	775,466	1,063	799,552
Italy	18	19,172	2	1,450	277	241,180	233	151,698
United Kingdom	283	250,293	415	829,982	4,183	3,184,530	5,545	5,111,008
Other Europe	82	91,421	346	1,461,191	1,565	1,355,249	2,736	3,357,408
Canada	298	423,016	127	143,916	5,558	7,473,333	3,981	5,024,978
Mexico	24	41,354	5	8,200	199	362,733	73	87,384
West Indies and Bermuda	35	36,110	72	51,792	405	397,538	466	394,342
South America	182	181,230	48	33,242	2,271	2,554,210	963	775,504
British Oceania	356	310,163	190	169,582	2,774	2,585,389	3,075	2,619,212
Asia and other Oceania	231	226,694	63	71,956	2,001	1,974,777	1,295	1,240,336
Other countries	176	150,087	28	22,991	1,892	1,644,585	989	883,753
Total	1,776	$1,793,222	1,404	$2,965,351	22,729	$23,095,080	21,571	$21,241,860
TIRES:								
Belgium	....	$180	.....	.....	.....	$98,949	.....	$301
Germany	....	3,238	.....	.....	.....	425,773	.....	81,917
England	.....	68,135	.....	$103,894	.....	1,198,419	.....	1,174,955
Canada	.....	79,606	.....	37,093	.....	1,057,285	.....	833,065
Mexico	.....	19,965	.....	9,792	.....	133,663	.....	59,957
Philippine Islands	.....	9,418	.....	31,735	.....	111,257	.....	124,310
Other countries	.....	56,574	.....	65,045	.....	455,785	.....	529,407
Total	.....	$237,116	.....	$247,559	.....	$3,481,131	.....	$2,803,912

	October				10 months ending October			
	1913		1914		1913		1914	
IMPORTS	Number	Value	Number	Value	Number	Value	Number	Value
Automobiles .....Dut.	29	$74,646	32	$79,476	417	$983,445	218	$373,086
Parts of (except tires).Dut.	.....	50,595	.....	85,564	.....	242,031	.....	784,188
BY COUNTRIES.								
AUTOMOBILES:								
France	15	$38,961	2	$1,837	158	$370,272	60	$118,204
Germany	1	3,000	1	3,852	78	205,931	11	20,408
Italy	6	11,455	1	2,526	74	137,373	67	76,906
United Kingdom	5	16,691	22	67,436	42	128,993	46	118,469
Other countries	2	4,539	6	3,825	65	140,876	34	39,099
Total	29	$74,646	32	$79,476	417	$983,445	218	$373,086

Spring Maker to Work with Truck Builder

Will Decline to Increase Spring Suspension for Dealers or Owners Without Consent of Truck Manufacturers—To Prevent Overloading Vehicles

NEW YORK CITY, Dec. 12—Manufacturers of leaf and supplementary springs have been asked by the Commercial Vehicle Committee of the N. A. C. C. to co-operate with the Chamber in its efforts to discourage the overloading of motor trucks.

Attention of the truck makers having been called to instances in which dealers and truck owners have asked spring makers to increase the capacity of the rear spring suspension of trucks so that loads greatly in excess of the rated capacity of the chassis could be carried, a circular letter was addressed to spring makers in general, stating that the truck manufacturing members of the Chamber of Commerce almost unanimously deprecated such practice, which leads to overloading and consequent injury of the vehicle.

It was pointed out that the springs as originally built into the chassis are carefully proportioned to the axle, wheels, tires, and driving mechanism, which are guaranteed only for the factory rated load capacity, and that the substitution of stronger springs and the carriage of heavier loads causes unexpected stresses in these parts, with probable consequent breakages.

A number of spring makers already heard from have agreed to notify the truck manufacturer of any orders received from dealers or owners to increase the spring capacity of his trucks and to decline to fill such orders without his consent, as suggested by the N. A. C. C.

Annual Banquet for January 5

In connection with the Fifteen Annual Automobile Show at Grand Central Palace in New York, the National Automobile Chamber of Commerce has decided to hold its annual banquet at the Waldorf-Astoria on Tuesday, January 5, 1915, which is during show week. The Banquet Committee, consisting of Messrs. Hugh Chalmers (Chalmers), chairman; Henry B. Joy (Packard); Benjamin Briscoe (Briscoe); Chas. T. Jeffery (Jeffery); and Fred W. Haines (Regal), has promised some interesting and novel features.

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Plantation Rubber Shipments for United States

NEW YORK CITY, Dec. 14—The English embargo on the shipment of rubber from the Far East is still in effect; consequently only a relatively small amount of it is afloat. Negotiations are now in progress which may result in the shipment of some plantation rubber from London to this city for the United States Rubber Co. and its subsidiaries. Arrangements have been made for the sailing of two ships, carrying the Dutch flag, direct from Sumatra to New York City, loaded with plantation grades of rubber for the above company. They are to leave the Far East this month. The steamship Hawaiian, of the Hawaiian-American Line, arrived in this port last week from the west coast of Africa with a cargo of rubber consigned to the Continental Rubber Co., this city.

As a result of the English embargo and the interruption of transportation earlier by German cruisers, the price of both plantation and Brazilian grades has advanced sharply. It is pointed out, however, that the price now is governed almost wholly by the manner of transportation. If satisfactory shipping facilities could be arranged, it is stated, the prices for both plantation and Para rubber would decline. The falling off in consumption in Europe has been pronounced because of the war, and this country has been at least 15 per cent. below last year. The output of rubber, both in the Far East and in Brazil, has been large. If it could only be placed safely in the hands of consumers the supply would be materially in excess of the demand, which, of course, would bring prices down, as already stated. At the present time the stocks of crude rubber in the United States are comparatively small. There is plenty of it in England, but it is being held there because of the fear that if it is released it would find its way into the hands of manufacturers in countries with which England is at war.

A number of the large Akron factories are busy supplying large war orders for rubber goods. As a result the rubber stock market has become materially strengthened. Stocks have leaped from $6 to $45 a share.

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Cocoanut Water as Rubber Coagulant

NEW YORK CITY, Dec. 14—An article appearing in the Daily Consular and Trade Reports states that an important discovery, it is claimed, has been made in the use of cocoanut water as a rubber coagulant. Millions of gallons of cocoanut water, which now runs to waste, can be utilized as a profitable by-product.

Details of the process are not now available, but it is understood that the cocoanut water is allowed to ferment for 4 or 5 days, after which it can be used immediately for coagulating latex. One to 2 ounces of the fermented liquid will coagulate 1 pint of pure latex. It is said to produce a better rubber than that procured from the present method of using crude acetic acid, especially so far as color goes, and clearer than that obtained from the cocoa-fermentation acid treatment.

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Automobile Safety Devices on Exhibition

NEW YORK CITY, Dec. 13—The second annual safety and sanitation exhibition in Grand Central Palace opened today. There are 200 booths devoted entirely to safety devices and inventions. Among the safety devices are several for automobiles, namely, the Auto Signalite, a rear signal manufactured by the Auto Signalite Co., this city; the McNutt non-explosive gasoline can, McNutt Can Co., this city; the Matisse no-glare spherical paraboloid lenses and electric dimming devices, C. & A. Matisse, this city, and the elastic safety buffer, Douglass Mfg. Co., this city. There are also a number of accessories such as the Shaw one-piece wrench, J. Edward Dunn Co., this city, and the Recordograf, a tape recorder, for use in commercial car work, American Taximeter Co., this city. This company also shows a taximeter and a hub odometer, called the Transimeter. The Bristol Co., Waterbury, Conn., is manufacturing the Bristo patent safety set screws.

In the Exposition of Inventions such recent inventions as the automobile automatic turning headlight, patented by Charles S. Parcells, No. 1,091,532, March 31, 1914, and an automatic locknut and axle for vehicles patented by G. Huettner, No. 846,349.

Design for Made-in U. S. A. spirit that is being widely suggested

Automobile Securities Quotations

NEW YORK CITY, Dec. 15—On Saturday the Stock Exchange was re-opened after the longest recess in its history. On Monday it was announced that the market was open for tradings in all securities, upon which the already bustling activity increased at once. Nearly all the stocks showed slight gains over the quotations for last week and some were substantially higher. General Motors common went up 8 1-2 points and the preferred 3 1-2, Willys-Overland common gained 3 1-2, Maxwell stocks went up slightly and Reo Truck added 1-2 point. Studebaker common dropped and preferred gained 1 point. Of the tire stocks, Swinehart showed the largest gain by climbing from the 69 of last week to 87, or an increase of 17. Goodrich preferred went up 6 points and the common lost 1-2. Goodyear common added 5 points and preferred 1. U. S. Rubber gained 5.

	1913 Bid	1913 Asked	1914 Bid	1914 Asked
Ajax-Grieb Rubber Co. com	195	220	250	..
Ajax-Grieb Rubber Co. pfd	97	102	100	..
Aluminum Castings pfd	98	100	95	100
J. I. Case pfd	..	..	..	..
Chalmers Motor Co. com	..	94	..	90
Chalmers Motor Co. pfd	90	95	87½	92½
Electric Storage Battery Co	..	..	48¼	49¼
Firestone Tire & Rubber Co. com	235	242	340	..
Firestone Tire & Rubber Co. pfd	100	101	109	111
Garford Co. pfd	78	90	..	..
General Motors Co. com	35¾	37	84½	86½
General Motors Co. pfd	75	76	89½	91½
B. F. Goodrich Co. com	17	18	25	26
B. F. Goodrich Co. pfd	75½	76	94	96
Goodyear Tire & Rubber Co. com	185	192	185	191
Goodyear Tire & Rubber Co. pfd	90	92	101	102
Gray & Davis, Inc., pfd	94	101	..	..
International Motor Co. com	..	5	..	..
International Motor Co. pfd	..	14	..	..
Kelly-Springfield Tire Co. com	..	..	68	69
Kelly-Springfield Tire Co. 1st pfd	..	..	77½	78½
Kelly-Springfield Tire Co. 2d pfd	..	..	95	97
Maxwell Motor Co. com	2½	3	14¼	14⅝
Maxwell Motor Co. 1st pfd	18¼	18¾	43½	45
Maxwell Motor Co. 2d pfd	6½	7	17½	18¼
Miller Rubber Co	115	121	160	..
New Departure Mfg. Co. com	140	150	..	..
New Departure Mfg. Co. pfd	100	102	..	..
Packard Motor Car Co. com	..	..	..	100
Packard Motor Car Co. pfd	90	95	90	..
Peerless Motor Car Co. com	15	25	15	20
Peerless Motor Car Co. pfd	75	80	..	55
Pope Manufacturing Co. com	1	3	..	..
Pope Manufacturing Co. pfd	10	15	..	..
Portage Rubber Co. com	..	30	25	30
Portage Rubber Co. pfd	..	85	80	85
*Reo Motor Truck Co	5	7	10½	11½
*Reo Motor Car Co	13½	14½	21½	22½
Splitdorf Electric Co. pfd	40	45	..	..
Stewart-Warner Speed. Corp. com	55	57	47	49
Stewart-Warner Speed. Corp. pfd	95½	97½	97	100
Studebaker Corp. com	17	18	32½	34
Studebaker Corp. pfd	65	67½	87	88
Swinehart Tire & Rubber Co	65	70	87	88
Texas Co.	..	..	130½	132½
U. S. Rubber Co. com	54	55	50	..
U. S. Rubber Co. pfd	100	100¼	100	102
Vacuum Oil Co	191	194	198	204
White Co. pfd	105	110	107	110
Willys-Overland Co. com	58	62	80	84
Willys-Overland Co. pfd	81	85	86	90

*Par value $10; all others $100 par value.

Market Reports of the Week

MARKET prices this week were mostly steady. A few of the metals, however, rose. Both copper and tin saw a steady rise from Wednesday. Both electrolytic and Lake coppers rose $0.00 3-8 a pound while tin rose $1.85 per 100 pounds. Lead remained steady but quiet. Antimony is in moderate demand and weaker at $0.12. Cyanide potash came down $0.02 a pound. Sulphuric acid is meeting with a seasonable demand, and the market retains a steady tone. Cottonseed oil dropped to $5.68 a barrel this week, a drop of $0.13. The market for plantation rubber and fine Up-River Para, was firmer, but aside from this, the situation lacked new features. Consumers manifested little interest in the situation, being disposed, apparently, to use up some of the supplies on hand before purchasing freely.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Changes
Antimony	.13	.13	.13	.13	.13	.12	—.01
Beams & Channels, 100 lbs.	1.21	1.21	1.21	1.21	1.21	1.21	.....
Bessemer Steel, ton	18.00	18.00	18.00	18.00	18.00	18.00	.....
Copper, Elec., lb.	.12¾	.12¾	.12⁹⁄₁₀	.13	.13⅛	.13⅛	+.00⅜
Copper, Lake, lb.	.12⅞	.12⅞	.13	.13⅛	.13¼	.13¼	+.00⅜
Cottonseed Oil, bbl.	5.81	5.81	5.84	5.80	5.75	5.68	—.13
Cyanide Potash, lb	.23	.23	.21	.21	.21	.21	—.02
Fish Oil, Menhaden, Brown	.38	.38	.38	.38	.38	.38	.....
Gasoline, Auto, bbl.	.13	.13	.13	.13	.13	.13	.....
Lard Oil, prime	.90	.90	.90	.90	.90	.90	.....
Lead, 100 lbs.	3.80	3.80	3.80	3.80	3.80	3.80	.....
Linsed Oil	.47	.47	.47	.47	.47	.47	.....
Open-Hearth Steel, ton	18.00	18.00	18.00	18.00	18.00	18.00	.....
Petroleum, bbl., Kans., crude	.55	.55	.55	.55	.55	.55	.....
Petroleum, bbl., Pa., crude	1.45	1.45	1.45	1.45	1.45	1.45	.....
Rapeseed Oil, refined	.71	.71	.71	.71	.71	.71	.....
Rubber, Fine Up-River, Para	.71	.71	.71	.71	.71	.71	.....
Silk, raw, Ital.	..	3.90	..	..	3.90	3.90	.....
Silk, raw, Japan	..	3.17½	..	..	3.17½	3.15	—.02½
Sulphuric Acid, 60 Baume	.90	.90	.90	.90	.90	.90	.....
Tin, 100 lb.	32.75	32.75	33.50	33.75	34.25	34.60	+1.85
Tire Scrap	.05	.05	.05	.05	.05	.05	.....

Hood Tire Co. Is Organized

WATERTOWN, MASS., Dec. 12—The Hood Tire Co. has been organized as a distinct corporation to manufacture automobile tires in Watertown, Mass., instead of having the work done as part of the general production of the Hood Rubber Co. The latter company does a big business in all kinds of rubber goods, including tires, but it was felt that there should be a separate company formed for the tires so that it could be better developed. Charles W. Daily is president and treasurer and Herbert E. Ross and Robert Muir are the other officers. The new company's capital is $20,000.

LANSING, MICH., Dec. 15—The Reo Motor Car Co. has declared its regular quarterly dividend of 2 1-2 per cent. payable January 1 to stock of record December 19.

Unisparker Wins Medal for Kent

PHILADELPHIA, PA., Dec. 11—Arthur Atwater Kent, of the Atwater Kent Mfg. Works, Philadelphia, Pa., has been awarded the John Scott Legacy and Premium by the City of Philadelphia for the Atwater Kent Unisparker and ignition system. This medal and premium were bequeathed by John Scott, chemist, of Edinburgh, who in 1816 created an endowment to the City of Philadelphia directing the interest and dividends to be divided annually among "ingenious men who make useful inventions." In 1834 the city vested the award of this medal in the Franklin Institute of the State of Pennsylvania. This is believed to be the first time that this medal has been awarded to a manufacturer of automobile parts.

Both sides of John Scott medal, presented to Arthur Atwater Kent

Walker Absorbs Chicago Electric

Truck Concern Buys Factory and Business—To Make Three Passenger Models

With the Property Practically Complete Organization Will Go with Walker Co.

CHICAGO, Dec. 14—The Walker Vehicle Co. of this city, maker of electric commercial cars, has purchased the factory and business of the Chicago Electric Motor Car Co. maker of Chicago electric passenger vehicles, which concern suspended business in October of this year. The manufacture and sale of Chicago electrics will be continued, the construction work to be done at the plant of the Walker company and the sales for Chicago on the site of the former sales agency for these cars. With the transfer of property practically the complete organization including the factory and service men will continue with the Walker company, Gail Reid formerly secretary and sales-manager of the Chicago Electric Motor Car Co., taking the office of general sales-manager.

Under the name of Chicago electrics the Walker company will market three models known as Models 151, 152 and 153. Models 151 and 153 are rear seat drive, four-passenger limousines, identical except that in Model 153 the right front seat is revolving, while in 151 the front seat extends across the car and is stationary. These models sell at $2,650. Model 152 is a front seat drive, five-passenger limousine and sells for $2,850.

The Chicago Electric Motor Car Co. was organized in 1912 by the late Frederick J. Newman. It was reorganized in November, 1913, for the purpose of expanding the business and invading the commercial-car field. In October, 1913, arrangements were made to liquidate the entire business.

Hoosier Automobile Men Are Optimistic

INDIANAPOLIS, IND., Dec. 14—The industrial and financial situation in Indiana has clarified to an encouraging extent and automobile interests regard the outlook for the coming year as very encouraging. Manufacturers of motor cars, parts and accessories have taken an increased activity within the last few days and still further improvement is promised.

The money market is much easier than it has been for several months which has permitted a resumption of activity in many lines. Orders for war equipment from European countries has caused thousands of men to be put back to work.

In the rural communities there has been little complaint, for farmers have had a prosperous year, due to large crops. The only complaint has been of losses suffered in certain parts of the state through the foot and mouth disease.

Kalamazoo Co. to Build 200 Trucks

KALAMAZOO, MICH., Dec. 12—According to President F. G. Clark, the Kalamazoo Motor Vehicle Co. will build 200 trucks in 1915. During the first year of the company, which ended in September, the output was twenty-five trucks. President Clark declares that during the second year of the existence of the company it is planned to build 200 thirty horsepower, 1 1-2 ton trucks, similar in design to the first model, although with several minor improvements which have been adopted. For those who desire to combine a light and heavy truck in one vehicle the company has devised the use of a trailer which will carry 3 tons, giving a capacity of 4 1-2 tons per haul.

Goodyear Officers and Directors Re-Elected

AKRON, O., Dec. 12—At the annual meeting of the Goodyear Tire and Rubber Co., last week, the stockholders re-elected the directors, F. A. Seiberling, C. W. Seiberling, G. M. Stadelman, F. H. Adams, P. W. Litchfield, H. B. Manton and J. P. Loomis—and the officers of the company were also re-elected, as follows: F. A. Seiberling, president and general manager; C. W. Seiberling, vice-president; G.. M. Stadelman, secretary; F. H. Adams, treasurer; W. E. Palmer, assistant treasurer, and P. W. Litchfield, factory manager.

DETROIT, MICH., Dec. 12—The stock, machinery and equipment of the bankrupt Benham Mfg. Co., which made the Benham six cars has been purchased by the Frank Bros. Iron & Metal Co., Orleans and Grand Boulevard, for $4,500. The assets of the defunct company were estimated by it to be worth about $40,000 but the appraisers reduced this figure to $15,000. The Union Trust Co., receiver, has not yet disposed of the real estate. The Puritan Mfg. Co. was the purchaser of the repair parts, tools, jigs, drawings, good will and name of the Benham company.

Form Company to Make Searle Tube

NEW YORK CITY, Dec. 12—The Searle Unburstable Inner Tube Co. has been incorporated in New York State with the ultimate object of manufacturing the Searle Unburstable inner tube; the tube is an English product which was demonstrated in New York City but a few months ago. The plans of the company are not fully developed. The incorporators are two attorneys and Orson Kilborn, son of Horace M. Kilborn, of the National City Bank, New York. The capitalization is $400,000.

Lyons-Atlas Capital Is $1,500,000

INDIANAPOLIS, IND., Dec. 12—An increase in capitalization from $1,000,000 to $1,500,000 has been made by the Lyons-Atlas Co., of this city, which is preparing to market a new, medium-priced car. Experiments on the new car have been under way for several months and are nearly completed.

Sparks Elected Mayor of Jackson

JACKSON, MICH., Dec. 8—William Sparks, secretary and treasurer of the Sparks-Withington Co., was today elected mayor of this city by a vote of almost 2 to 1 over his competitors. Mr. Sparks was a representative of the Charter Club, an organization for the maintenance of good government in Jackson.

DETROIT, MICH., Dec. 12—Frank J. Mooney, sales and advertising manager, and Charles E. Buck, his assistant, have resigned from the Hupp Motor Car Co. Their successors have not been chosen. Mooney had directed the Hupp advertising for several years and some time ago assumed charge of sales, Buck becoming his assistant at that time.

NEW YORK CITY, Dec. 12—J. C. Nichols, Inc., 1671 Broadway, at present New York City distributor for Wheeler & Schebler, Indianapolis, Ind., has been appointed exclusive Eastern representative of the Disco Co., Detroit, Mich. He will distribute the newly perfected Disco electric lighting and starting system for Ford cars.

Co-operative Plan for Federal Truck Dealers

NEW YORK CITY, Dec. 14—A new plan to get co-operation among truck dealers in small towns has been made by M. L. Pulcher, general manager of the Federal Motor Truck Co. His idea is for them to consider the truck needs of their community and recommend to prospective purchasers the particular size and model of truck which tests have proved to be the best for the purpose.

DETROIT, MICH., Dec. 14—Charles Denby will take charge of the export sales department of the Hupp Motor Car Co. He recently resigned from the United States Diplomatic Service to take the above position. He was Consul General to Vienna, having left his post there on a leave of absence November 18, and arriving in this city on December 12 with his family.

NEW YORK CITY, Dec. 14.—The Dimond-Apperson Motor Co., 2000 Broadway, has been appointed Apperson distributor for this city and adjacent territory.

Zenith Elected Member of M. & A. M.

NEW YORK CITY, Dec. 14—At a meeting of the board of directors of the Motor and Accessory Manufacturers, held Friday, the Zenith Carburetor Co., Detroit, Mich., was elected to membership.

Third Used-Car Report Issued

Prices on 128 Makes of Gasoline Cars and 14 Electrics—General Response Throughout Country

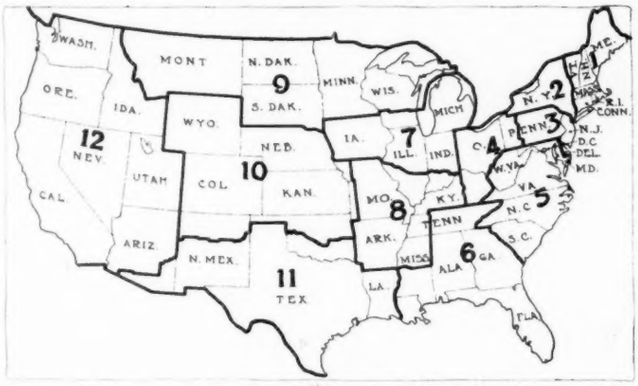
Improvements Planned for Next Issue —Trade Associations Promise Co-operation

CHICAGO, Dec. 14—The Chicago Automobile Trade Assn. has issued its third "Used-Car Central Market Report," which is the third edition since this work was taken up by the association. The prices in this issue are based on actual sales in the Chicago territory during July, August and September. Prices on 128 different makes of used gasoline cars and 14 makes of used electrics are included.

These reports on used cars have met with very general response throughout the country, the only objection thus far offered against the reports being a slight difference in market conditions in various sections of the United States, as compared with the Chicago zone. To correct this discrepancy the association has formulated a plan which is now being put into effect to collect sales data on used cars from different sections of the country with a view to compiling a national report. To collect these data the country has been divided into zones corresponding in area with those adopted by the Federal reserve banking system, and the trade associations within these zones are being asked for co-operation on the prices for used cars sold in the respective territories. A map showing the division of the country according to the Reserve Banking System is used as a basis of the work.

When this step from a local market report to a national one is taken the report pages will be altered, and will appear as in the illustration herewith which is a sample page inclosed in the current edition for the purpose of showing exactly how the national work will appear. The national report will be in the form of a booklet, 12 1-4 by 9. In the last column of each page on the national report will be published the "appraised as is value" for the Chicago zone only. This will be the only appraisement made, but a margin will be left in the book so that trade associations using the book can meet jointly and insert their local appraised value. The first issue containing the values as based on the zone system will appear in January and will be based on sales made during the months of October, November and December.

The work of collecting these sales data by trade associations in the different zones will not be a difficult matter and already several associations have notified the Chicago organization that they will co-operate in making this a national report.



Map of the United States, showing division into zones according to the Reserve banking system, used by Used-Car Central Market Report

Co-operative Garage for Electric Pleasure Cars

NEW YORK CITY, Dec. 12—The often-talked-of plan of a co-operative garage for electric pleasure vehicles has become a reality with the signing of a lease by the New York Electric Vehicle Assn., for a building on the southwest corner of Central Park West and Sixty-second street. A number of the leading manufacturers of electric pleasure vehicles are co-operating with the association in this undertaking. The Rauch & Lang, Detroit and Baker companies will have showrooms in the building, making it their headquarters. The various manufacturers will have their showrooms in the building and these are being rapidly fitted up for occupancy, while the garage itself is being equipped so as to make it in every way ideal for electric cars. It will start with accommodations for 150 cars, of which more than 100 have already been secured. It is planned there will be a fixed charge of $45 a month which will include battery charging, care of the car and taking the car to and from the owner's residence to the garage.

4-90 Five-Passenger Newest Chevrolet

NEW YORK CITY, Dec. 16—A new five-passenger touring car is announced by the Chevrolet Motor Co., New York City and Flint, Mich. It has a 20-horsepower, four-cylinder, valve-in-head type of motor, as conforms with standard Chevrolet practice. It is equipped with a magneto, 30- by 3-inch tires, 102-inch wheelbase and weighs 1,700 pounds, and lists at $490. It is called the 4-90.

It is stated that many special features will be found on this car which will be exhibited for the first time at the New York Show. These features include novelties in spring suspension, a steering gear mechanism, rear seat arrangement, clutch collar and hub cap. It is stated that double-acting, shock-absorbing springs, reinforced at the top and bottom of the center leaf are used and that the machine rides well and holds the road at all speeds. Patents have been applied for.

An unusually simple and light steering gear has been evolved. It is stated that it can be controlled with very little effort and that it will turn the car in a 20-foot circle.

A section of the back of the rear seat is removable, permitting the person occupying the center to relieve what is termed the hip-and-shoulder wedge. This permits a four-and-a-half-passenger car to be converted into a five-passenger car with a comfortable seating capacity. The car has an all-steel body with flush sides and concealed hinges with steel sills and door posts. A speed of 50 miles per hour is claimed.

USED CAR CENTRAL MARKET REPORT

CHALMERS—Mfd. by Chalmers Motor Co., Detroit, Mich.

Model	Year	Type	Pass. Capac.	Cyl.	H. P.	List Price	Chicago Market	ZONES 1	2	3	4	5	6	7	8	9	10	11	12	"Chicago Appraised As Is" Value.
F	1909	Rbt.-Tour.	2-5	4	24	$1500	As Is..	250	230	220	235	260	277	215	235	280	325	290	850	260	220
							P. O...	300	280	270	285	310	320	265	285	330	375	340	250	310	
							R. B...	350	330	320	335	360	377	315	335	380	425	390	300	360	
E	1909	Rbt. Tour.	2 5	4	40	2750	As Is..	400	380	360	385	410	427	365	385	430	475	440	350	410	300
							P. O...	450	430	410	435	460	477	415	435	480	525	490	400	460	
							R. B...	500	480	460	485	510	527	465	485	530	575	540	450	510	
30-K	1910	Pony Ton.	3-7	4	25	1600	As Is..	340	320	310	320	325	350	305	325	370	415	380	500	350	350
							P. O...	390	370	360	370	375	400	355	375	420	465	430	340	400	
							R. B...	440	420	410	420	425	450	405	425	470	515	480	390	450	
30-K	1910	Rd.-Tr.	3-7	4	25	1500	As Is..	400	370	380	385	410	427	365	385	430	475	440	440	410	350
							P. O...	450	420	430	435	460	477	415	435	480	525	490	400	460	

USED CAR CEN

Sample page from Used-Car Central Market Report inserted in third issue to show how pages will look in the national report which is now being prepared

To Continue Premier Cars

Business Good Under Receiver Smith, Who Is Elected Trustee —Creditors Are Optimistic

INDIANAPOLIS, IND., Dec. 15—Frank E. Smith, who has been receiver of the Premier Motor Mfg. Co., was elected trustee of this organization, at a meeting of the creditors before referee in bankruptcy Albert Rabb, here, and the manufacture of the Premier automobile will be continued.

The meeting developed the fact that the Premier is enjoying prosperity under the administration of Mr. Smith, more business having been done during the period of receivership, than in a similar period before the appointment of the receiver.

The Premier difficulties in the courts started on October 17, and since that time Mr. Smith had pruned down the organization, manufactured automobiles, sold them, and in various ways, profitably adjusted the financial affairs of the company, resulting in the successful building and distribution of the product.

That the Premier company will be allowed to exhibit at the Chicago show, carry on an advertising campaign, and bring out a new model car, in addition to the current models, were all brought up for discussion before the referee in bankruptcy and the assembled creditors.

Creditors stated that the plans, as outlined, would be carried out, as they would unquestionably show a profit, and might eventually bring the Premier back to its original, if not to a better position than it previously occupied.

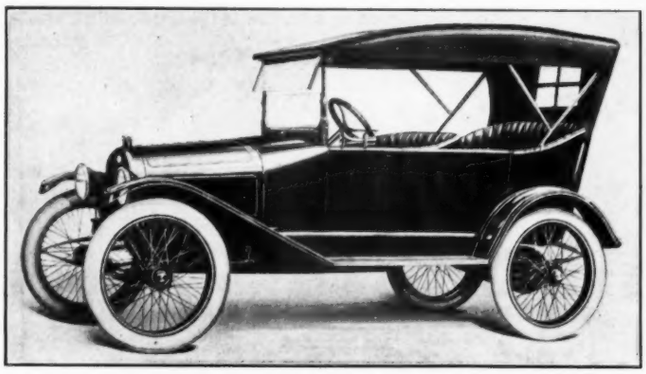
American Motors Discharged from Bankruptcy

INDIANAPOLIS, IND., Dec. 14—The American Motors Co. has been discharged from bankruptcy. The proceeding, a most unusual one, gives rise to what seems to be a well-founded report that V. A. Longaker and associates will soon announce plans for the return of the underslung type of motor cars to the market. Mr. Longaker when seen confirmed the court's discharge of the company from bankruptcy, but beyond saying he had no other announcement to make at the present time, he was quite reticent.

It is not unusual for individuals to receive discharges from the Federal Court in bankruptcy proceedings, but it is uncommon in the case of corporations and it was somewhat of a surprise when Judge Albert B. Anderson in the U. S. district court granted the discharge.

It has been known for a long time that someone would sooner or later revive the underslung type of motor car, such as was manufactured by the American Motors Co. During the company's embarrassment many overtures to revive the car have been made, but no one has been able to get inside plans. That at least 1,000 cars of the underslung type could have been moved from Indianapolis during the past year is believed to be a conservative estimate as a result of the many inquiries received.

The American Motors Co. was organized in Indianapolis in 1905. The plant was located in Indianapolis. It is estimated that between 3,000 and 5,000 cars of this type are now being run in the United States and Canada.



New Metz touring car selling for $600 with 105-inch wheelbase and Gray & Davis starting and lighting system

Stewart-Warner Denies Horn Patent Infringement

NEW YORK CITY, Dec. 15—Denying the charge that its hand-operated horn in any way infringes the Long hand horn patent No. 1,090,080, and claiming that the patent is invalid, the Stewart-Warner Speedometer Corp., of New York, filed its answer yesterday in the suit brought against it and the Stewart-Warner Speedometer Corp. of Virginia last month by Gottfried Piel and the G. Piel Co.

The Stewart-Warner interests claim that the Virginia corporation is not within the jurisdiction of the U. S. District Court for the Southern District of New York, in which the suit is brought, and their attorney will appear before the court Friday with a motion to dismiss the bill of complaint against it on that ground. On Friday the motion of the Piel company for a preliminary injunction will also come up.

In the answer filed by the New York corporation it is stated that its business is separate and distinct from that of the Virginia corporation and that its place of business at 233 W. Fifty-eighth street is not a regularly established place of business of the latter.

It asks for proof of the ownership of the Long patent and states that it is not true that the Stewart-Warner Speed-

Board of directors of Continental Motor Mfg. Co., Detroit, Mich. Left to right—B. F. Tobin, president and treasurer; R. W. Judson, vice-president; A. H. Zimmerman, secretary and assistant-treasurer; W. A. Fredericks, chief engineer; H. J. Warner, second vice-president; G. W. Yeoman, assistant to the president and director of sales

The Anderson Electric Car Co., Detroit, Mich., maker of Detroit electrics, has received orders from London for a number of buses similar to those already in use in that city. These buses, of the type illustrated above, are fitted with 60 A-8 Edison batteries capable of carrying the vehicle 50 miles on a charge. The capacity of each bus is thirty people

ometer Corp. of New York has made or sold automobile horns embodying the alleged inventions of patent 1,090,080 and claimed in claims 4, 5, 7, 8, 9, 10, 11, 12, 13 and 14. The answer declares that the only automobile horn the corporation has been selling does not closely resemble the hand-operated horn made by the G. Piel company. It denies that the G. Piel Co. created the hand horn business and states that the Stewart-Warner corporation entered the business of selling hand horns in straightforward business competition and that it was aware of the constructions on the market, none of which, it states, closely resembles the Stewart-Warner warning signal.

The answer goes on to claim that the Long patent is invalid for lack of invention, lack of novelty, for excess and for aggregation, and avers that Long secured his patent with intent to defraud and deceive, the structure covered not being his own but that of A. Aufiero, who is now contesting Long's right to the patent in the Patent Office at Washington. In proof of its charge that the Long patent is invalid the answer cited seven men and firms beside Aufiero who, it states, knew and practiced the alleged invention prior to the alleged invention thereof by Long.

It also cites patents to the number of fifty-nine which, it alleges, embody the ideas of the alleged inventions in the Long patent, and which were granted prior to the latter.

The answer concludes by asking that the bill of complaint against the Stewart-Warner Speedometer Corp. of New York be dismissed with costs.

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Metz Touring Car at $600

WALTHAM, MASS., Dec. 14—The Metz Co., this city, has placed on the market a touring car model selling at $600. It has a 105-inch wheelbase and elliptic springs. It is equipped with the Gray & Davis separate unit electric starting and lighting system. The streamline body has flush doors. The hood is tapering with a rounding top. Wire wheels, 32 by 3 1-2-inch, are used with Goodrich clincher tires.

The engine is water-cooled, with Bosch high-tension magneto and A. W. T. carbureter. The cylinders are 3 7-8 by 4, giving a rating of 24.2 horsepower and the valves, push rods and springs are completely inclosed. Other equipment includes a built-in gasoline gauge, speedometer, Hyatt roller bearings, signal horn, tire outfit, jack and tools complete. It has a fiber grip gearless transmission. According to the maker, the car is capable of 5 to 50 miles an hour on high.

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More States Declare War Tax

NEW YORK CITY, Dec. 14—The States of Illinois and Ohio have ruled that all applications for registering automobiles and motor trucks, as well as applications for chauffeur's licenses, must bear the usual 10-cent Federal revenue stamp. This ruling will apply on all 1915 registrations.

The State of Maryland, through Collector of Internal Revenue Miles, who raised the point that state licenses are not taxable under the emergency war tax law, has received assurances from the department in Washington that that view is correct. Now that Federal authorities have ruled the collection of war taxes on New Jersey licenses invalid, automobilists don't know how to get their money back.

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Refuses to Issue Kentucky Licenses

LOUISVILLE, KY., Dec. 12—Louisville automobile owners whose licenses are about to expire were thrown into a quandary yesterday when the Louisville Automobile Club was advised by the Commissioner of Motor Vehicles at Frankfort not to forward to Frankfort any applications for license renewals, owing to the refusal of Secretary of State Crecelius to accept the recent definition of his duties handed down by the Attorney General.

It was also made known that Secretary of State Crecelius had informed the automobile club that applications for automobile licenses sent to his office would be refused.

About 7,500 licenses, one-fourth of which are those of Louisville people, will expire January 1.

Car and Truck Registrations Steadily Increase

BOSTON, MASS., Dec. 5—The fiscal year for the Massachusetts Highway Commission, that controls the automobiles in the Bay State ended November 30 and the figures just compiled shows that motorists contributed a large amount of money to the state this year. The grand total reaches $965,669.59. That it did not go up closer to the million mark is due to the fact that the motorists showed greater respect for the law, and so while the total number of cars and drivers increased a great deal the fines this year were slightly more than in 1913. The fact that the increase in drivers was about 22 per cent. and the increase in cars 23 per cent. and the fines were nearly the same as a year ago is good evidence that motorists are getting away from the speed mania. The total amount for fees was $925,964.75 while in 1913 it was $803,196.51. The fines in 1913 totaled $39,043, and this year they reached $39,704.84. When the expenses of running the highway commission are deducted Massachusetts will have more than $800,000 for road maintenance of which $640,000 will be available for state roads and $160,000 for improving through routes that are under city or town control.

The registrations for the year totaled 77,246 motor vehicles. These figures include 8,236 commercial vehicles and thiry-nine cars owned by non-residents. A year ago there were 62,660 vehicles which included 5,948 trucks and 920 non-residents. The general increase was 23 per cent. for all vehicles and about 40 per cent. for commercial vehicles. The larger part of the cars registered were less than 30 horsepower and came under the $10 classification. As a matter of fact including the electrics and the trucks registered at $5 the number of vehicles paying $10 or less totaled 60,103 out of the 77,246. There was a gain of 180 in the manufacturers' and dealers' class. There are now 99,532 persons licensed to operate cars in Massachusetts, or about one in every 33. This is a gain of 18,488. The comparative figures for 1913 and 1914 appear herewith.

MADISON, WIS., Dec. 12—The state of Wisconsin's gross revenue from automobile and motorcycle registrations thus far in 1914 is $294,477, or nearly twice as much as was collected in 1913. On November 28 the total registrations by private owners at $5 each were 53,341; motorcycles, 7,876 at $2 each, and dealers, 1,202 at $10 each. It is expected that about 100 additional private owners' registrations will be made before December 31, when all licenses expire and must be renewed at the same price schedule. On January 1 the secretary of state predicted a registration of 45,000 private owners, but his estimate is already 8,341 wide of the mark. Applications for 1915 registrations will be received after December 15 and issued on January 1.

DENVER, COL., Dec. 12—Twenty thousand cars for Colorado in 1915 is the estimate made by Secretary of State James B. Pearce, who has just received his first consignment of license tags for the new year. The order calls for 19,000 regular tags and 1,000 dealers' tags. The total registration so far for 1914 is estimated at close to 19,000, but complete reports have not yet been received from the outside counties.

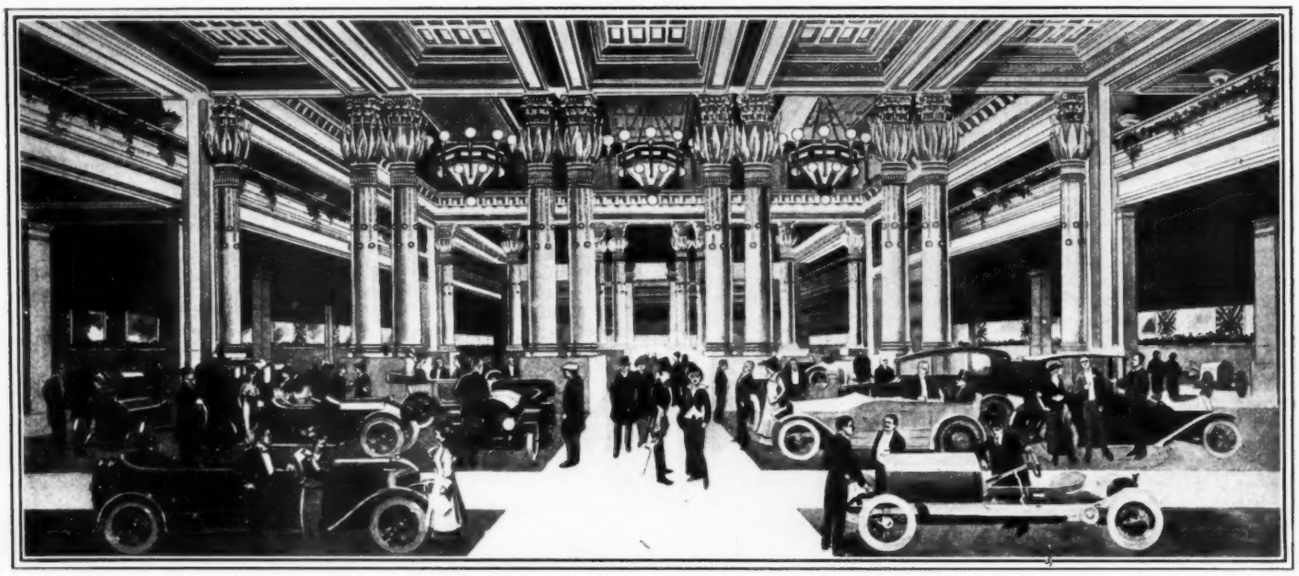
LANSING, MICH., Dec. 12—According to the figures given out by Secretary of State Martindale, there were 76,350 automobile licenses issued in Michigan so far this year.

TORONTO, ONT., Dec. 7—Over 6,000 automobiles are registered as owned in Toronto which is more than are numbered in many of the principal countries of the world. It is interesting to note that 50 per cent. or half the cars sold in Toronto are Fords while 85 per cent. of all the cars owned by medical men and 90 per cent. of all the cars owned by commercial firms in Toronto are also Fords, Toronto's total figure according to a recent census is equal to the number of cars owned in the kingdom of Hungary and a greater number than are owned in British South Africa, Sweden, Switzerland, Holland or Bulgaria.

Massachusetts Car Registrations for 1913 and 1914

	1913	1914	Increase
Motor Veh. (Total)*	62,660	77,246	14,586
Commercial Veh.	5,948	8,236	2,288
Non-residents	920	39	†881
Motorcycles	7,127	8,161	1,034
Mfrs. and Dealers	1,330	1,518	180
Operators	17,009	21,257	4,148
Chauffeurs	5,233	5,601	368
Operator Renew.	40,858	51,090	10,232
Chauf. Renew.	17,934	21,584	3,650
Examinations	7,288	7,497	209
Fines	$39,043.00	$39,704.84	$661.84
Total receipts	$803,196.51	$965,669.59	$162,473.08

* Includes commercial vehicles and non-residents.
† Decrease due to new law making visitors register for all year.



Plan for the decoration of the main hall at the Grand Central Palace, where the New York Automobile Show will be held, January 2 to 9. The general scheme will be that of a Persian garden. Many mirrors will be used

Business Poor in Australia

War Affects Trade Conditions —Reduces Market for American Cars—English Small Cars Gain

Millions of Pounds of Wool Lying Idle —Crop Outlook Unfavorable

SYDNEY, AUSTRALIA, Nov. 20—Business throughout Australia has fallen off considerably owing to the extremely dry condition of the country, and this on top of the war has just about made trade in all lines as slow as possible and there seems little chance of improvement so far as Victoria and South Australia are concerned. New South Wales and Queensland have been more fortunate and they are experiencing an improvement, but the export of motor cars from America to Australia during the next 12 months will be on a very limited scale.

The English light car is making big strides throughout the whole of Australia, and in such cities as Melbourne and Adelaide the English light car is taking hold very rapidly, doctors and traveling salesmen purchasing them in quantities.

There are many factors which enter into trade conditions at present in Australia and in a recent compilation of opinions from leading bankers and financial men the following nine conditions are considered of varying importance in determining the present condition of affairs:

1. The government is the biggest employer in the state and it is putting its men on half time.
2. Extra taxation is foreshadowed by both the state and commonwealth and the spending power of the community is necessarily certain to be reduced.
3. Industrial corporations, although they have earned dividends during the past year, are not disposed to pay them due to bank restrictions, and also because of the future outlook.
4. Banks will no longer advance to store-keepers, but are throwing the burden upon wholesale houses. They will not advance to farmers as in normal times.
5. Wheat crops throughout the Commonwealth are bound to be of restricted character and it is quite possible that wheat will have to be imported to meet local requirements. Drought conditions are certain to prevail throughout Australia. The estimated loss of wheat on last year's values is 10,000,000 pounds.
6. The wool at present is commanding a good price for the very best quality which is scarce, and the cheaper grades have no value whatever. These were usually purchased by the Germans. Eleven million pounds of wool in New South Wales alone are lying without a market.
7. Building operations cannot be financed as the banks refuse to make advances.
8. Mines have closed down in many sections and cannot ship or sell concentrate.
9. The contribution of men and ships for the war will cost for the year $10,000,000 and the financing of this will have to be arranged for. The government proposes to place a local loan and this is leading banks to fear a depletion of their gold reserve. Paper money, it is thought, will be issued by the government and the sovereign will go to a premium.

Four Entries for Indianapolis Race

INDIANAPOLIS, IND., Dec. 12—With the contest yet 6 months away, four entries are already lined up for the next Indianapolis 500-mile race, the last to register being Ralph DePalma, America's road racing champion, with his Grand Prix Mercedes. Through his backer, E. C. Patterson, DePalma made entry this week, desiring to be as close to the head of the list as possible, because of the Hoosier elimination trials, which take place in the inverse order of nomination each year.

Though defeated at Corona, DePalma has great hopes of capturing the Indianapolis classic, since, out of all the machines that raced in the western contest, his was practically the only one conforming to the new 500-mile specifications, being well under 300 cubic inches, the limit prescribed by the speedway management, and tested in over 1,500 miles of actual racing.

A.A.A. Plan Annual Meeting May 17-18

NEW YORK CITY, Dec. 14—The American Automobile Assn. will hold a spring meeting at Boston, Mass., next year instead of a winter one. The Executive Board of the association decided at its December session in Washington, D. C., to postpone the meeting until May 17-18. At that time of the year the main highways in most of the states are in practical condition, and it has long been the opinion of many of the members that the annual gathering should be one to which one could tour over the roads.

At the conclusion of the Boston meeting it is quite probable that a party of transcontinental tourists will start for the Panama-Pacific Exposition.

Bull Tractor Sells for $395

MINNEAPOLIS, MINN., Dec. 14—It was stated in THE AUTOMOBILE for December 3 that the Bull tractor, which is manufactured by the Bull Tractor Co., this city, sells for $335. This was incorrect, as the price of the tractor is now $395, an improved design having been placed on the market.

A 2-Mile Board Speedway for Chicago

Contract Signed for Construction of Track for Speedway Park Assn.—315-Acre Site Secured—Contractor Gives $200,000 Bond to Complete Work June 1, 1915

CHICAGO, ILL., Dec. 12—After having built at least a half-dozen speedways on paper, it really begins to look as if Chicago is about to come into its own and that by the middle of next summer this city will have a track for automobile racing that will stand comparison with any in the country. This is the offering of the Speedway Park Assn., which announced today that it had placed the contract for the construction of a 2-mile board speedway to be completed by June 1 under the terms of the agreement.

The association was formed last June but purposely the organizers have refrained from publicity until all its plans had matured. The climax came last night with the signing of the contract for the actual construction of the track. The full title of the organization is the Speedway Park Assn., and the Speedway Park Club with headquarters in the Marquette building, Chicago. It has secured 315 acres of level ground situated on the west side of the city west of the Desplaines river between Maywood and Riverside, bounded on the north by Twelfth street, on the south by Twenty-second street, on the east and west by First and Ninth avenues and reached by nine transportation lines. Those who drive from the business section will have a fine 10-mile drive over boulevards.

The officers include: David F. Reid, a stock and bond broker, president; Charles McHugh and Harvey F. Harvey, vice-presidents, and Judson G. Hancock, secretary-treasurer. The directors are George W. McFatrich, Peter S. Thuerer, C. H. Stebbins, Jay F. Pitts, Joseph Hopp, John Irwin and John C. Roth, all prominent business men. Graham, Burnham & Co., are the architects.

The financing has been secured by means of a membership proposition. The full allotment of 1,000 members at $250 per has been secured, it is claimed, which put $250,000 into the treasury. In addition to that the directors have pledged $500,000, for which they will take stock if necessary. The lists having closed, it now is contemplated selling another 1,000 memberships at $50 a year which will not carry any stock.

The contract for the track calls for a minimum expenditure of $500,000 and with the maximum at $1,000,000. The contractor has given a bond of $200,000 to complete the work by June 1 and next week 500 men will be put to work on the property. Fortunately the land is vacant so no time will be lost in wrecking old buildings. Work will be continued all winter.

The track surface is to be 2 by 4's laid edgewise with 1-4-inch space between. The supports are to be of wood set at proper intervals upon concrete foundations or piers, the bottom of which will be below the frost line. The straightaway runs are to be pitched about 1 foot toward the inside. The north turn is to be figured for a maximum speed of 90 miles an hour. The south turn track level at the outer edge is to be the same level as the north turn, although the radii are not alike.

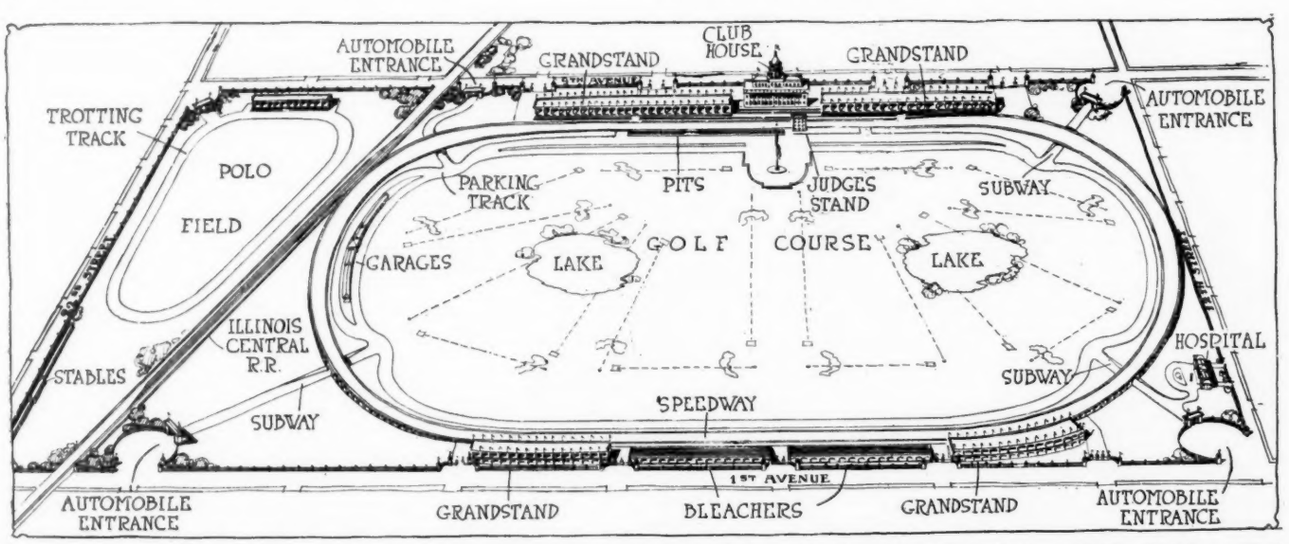
The track will be 60 feet wide on the homestretch and 70 feet on the turns. On the first turn there will be three different radii and the whole idea is to secure a speedway that will be safe and at the same time produce interesting competition. The backstretch will be 50 feet wide.

The race will be open to cars of a piston displacement of 300 cubic inches and under and will be for 500 miles. Qualifying trials will be for a speed of 85 miles per hour. The purse will be close to $50,000.

The speedway itself is not the whole issue in the proposition, for it also is planned to have golf links, polo field, aviation course and an equestrian course. The speedway itself will be built first.

Richard Kennerdell, chairman of the Contest Board of the A. A. A. spent today in this city in order to adjust the threatened conflict in dates between the new Chicago Speedway and the mile-track interests at Galesburg, Ill. Galesburg had been allowed June 16 as a sanction date for its $5,000 dirt track meet. The Chicago Speedway wanted this date. A compromise has been effected, Galesburg taking June 9, and leaving June 16 open for the new speedway. Chairman Kennerdell has insisted that the speedway authorities make reasonable progress in order to hold this date and has delegated Clifford Ireland, a member of the Contest Board, representing Illinois, to inspect the Chicago plant on February 1 to ascertain if sufficient progress has been made to warrant a possible meet on June 16. If such progress has not been made the sanction date will be cancelled. F. E. Edwards, technical representative of the A. A. A. contest board has signed with the speedway as contest manager.

At this date ten entries have been received for the Vanderbilt and Grand Prize races to be held in San Francisco, February 22, and March 1; the entries include three Maxwells, three Mercers, two Peugeots, and two Stutz. There is promise of an additional Stutz entry.



Plan of the 2-mile board speedway, polo field, golf course, etc., to be constructed by the Speedway Park Assn. and the Speedway Park Club at Chicago, Ill.

Factory Miscellany

LANSING'S New Factories Cost $1,000,000—During the year 1914 more than $1,000,000 will have been spent in Lansing, Mich., in new buildings, and more than half is credited to the automobile industry. One company, the Reo Motor Car Co., figures on the list for over $400,000, and its total floor space is now 22½ acres. The new forge plant of the Atlas Drop Forge Co. is 675 feet long and 105 feet wide, and cost over $65,000. The new plant of the Capital Auto Body Co. cost over $40,000, and is one of the largest automobile body manufacturing factories in this state.

U. S. Tire Adds—The United States Tire Co., New London, Wis., will erect a four-story addition, 70 by 70.

Carbureter Plant for Dwight—Edward A. Atkins, Dwight, Ill., will establish a plant for the manufacture of a patented carbureter.

Peerless Starter Adds—The Peerless Air Motor Co., Stanfield, Ore., will erect a windmill factory at Stanfield, 50 by 100, of concrete.

Parker Purchases Trenton Bldg.—The Parker Motor Co., Trenton, Mich., has purchased the building and equipment of the Trenton Engine Co.

Shaw Adds $35,000 Bldg.—The Shaw Motor Co., Chicago, will erect a brick and concrete shop building, 60 by 108, to cost $35,000, at Prairie du Sac, Wis.

Bartlett to Build—The Bartlett Automobile Co., Stratford, Ont., of which C. Bartlett is manager, has had plans drawn for a factory to cost, equipped, about $50,000.

Full Force at Buick Factory—The Buick Motor Co., Flint, Mich., which several weeks ago reduced its working force, is now again working with its full force, or over 5,000 men. It is expected that the average daily shipments in December will be 140 to 150 cars.

Jeffery-Dewitt in New Field—The Jeffery-Dewitt Co., Detroit, Mich., manufacturer of spark plugs, has entered a new field, that of manufacturing high-grade small porcelain ware for the use of the plumbing trade. They expect to turn out 35,000,000 pieces within a year. European porcelain ware is no longer available.

Edison Battery Works Saved—Of the thirty-four buildings composing the plant of Thomas A. Edison, Inc., West Orange, N. J., three brick buildings and five or six of the new concrete buildings were destroyed by fire which started in the evening of December 9. The estimated loss is placed at less than $1,000,000. The laboratory and three other buildings, among them the one in which the storage batteries are manufactured, were saved. The primary battery building and all the structures in which the new phonographs, picture films and numbering machines are made were burned down.

Eureka Spring Wheel Establishes Plant—The Eureka Spring Wheel Co., Brockton, Mass., has been organized to put that device on the market, and the men backing it comprise Henry G. Martis, George S. Bent, John W. Barlow and James A. Case, of Brockton; Harvey D. Lincoln, of Attleboro, and Clinton Gowdy, of Springfield. The company has established a plant at 124 Court street there, and it is being equipped with machinery. The officials are displaying samples of the wheels in some of the larger Massachusetts cities. They state that by means of a series of springs taking the place of the ordinary spokes it is possible to use solid tires and get as good resiliency as from pneumatics at a great saving of expense.

Manufactures Automobile Upholstering—The National Car Equipment Co. has been incorporated at South Bend, Ind., to manufacture automobile top covers and upholstering of automobiles. The capitalization is $20,000. F. J. Cosgrove, of Chicago, is president, and Norman Roos, of South Bend, is vice-president. According to Mr. Cosgrove, the National Car Equipment Co. has taken over the Topeka (Kan.) Auto Trimming Co., and has moved the equipment to South Bend on account of better shipping facilities offered. The concern will start operations this week with a force of twenty-five men.

Metz's New $250,000 Plant—The Metz Co., Waltham, Mass., has just had finished for it a new plant covering 4 acres of ground which cost the company, with the land, a total of $250,000. It is now fully equipped with the latest machinery and the mechanical departments are now housed together so that there is no time lost in putting the cars together. All parts of the car are made here. The old plant is still in use and it will not be given up because the demand for the cars calls for all the space the company can secure. The new buildings are one story, with saw-tooth construction of roof, giving maximum lighting efficiency. Spur railroad tracks run to the factory, and during the past month the company has been making shipments in carload lots.

The Automobile Calendar

Dec. 12-19.....Akron, O., Show, Akron Auto Show Co., O'Neill Bldg.
Dec. 14-18.....Chicago, Ill., American Good Roads Congress.
Jan. 2-9.....New York City, Annual Automobile Show, Grand Central Palace.
Jan. 2-9.....New York City, Automobile Salon, Grand Ball Room of Astor Hotel, Automobile Importers' Alliance, E. Lascaris, Pres.
Jan. 3-10.....Buenos-Aires, Argentina, Grand Prize of Argentina.
Jan. 5-7.....New York City, Engineering Societies' Bldg., Winter Meeting Society of Automobile Engineers.
Jan. 8-14.....Milwaukee, Wis., Show-Auditorium, Milwaukee Auto. Dealers' Assn.
Jan. 8-14.....Kansas City, Mo., Show.
Jan. 9.....San Diego, Cal., Road Race.
Jan. 9-16.....Philadelphia Show, Metropolitan Bldg., Philadelphia Auto. Trade Assn.
Jan. 16.....Detroit, Mich., Show.
Jan. 16-23.....Cleveland, O., Show, Cleveland Automobile Show Co., F. H. Caley, Mgr.
Jan. 20-28.....Lancaster, Pa., Hiemenz Auditorium.
Jan. 23-30.....Montreal, Que., Show, Allen Line Liverpool Bldgs., Montreal Automobile Trade Assn., T. C. Kirby, Mgr.
Jan. 23-30.....Chicago, Ill., Automobile Show, Coliseum and First Regiment Armory.
Jan. 25-30.....Fall River, Mass., Show.
Jan. 25-30.....Buffalo, N. Y., Show, Broadway Auditorium, Buffalo Automobile Dealers' Assn.
Jan. 30-Feb. 6....Columbus, O., Show, Memorial Hall, Columbus Auto. Club and Columbus Auto. Trades Assn.
Jan. 30-Feb. 6....Minneapolis, Minn., Show, National Guard Armory, Minneapolis Automobile Trade Assn.
Feb.....Portland, Ore., Show, Portland Auto. Trade Assn.
Feb.....Toledo, O., Show, Toledo Auto Show Co.
Feb. 2-7.....Kalamazoo, Mich., Show, Armory.
Feb. 15-20.....Grand Rapids, Mich., Show, Klingman Furniture Exposition Bldg., Grand Rapids *Herald*; C. L. Merriman.
Feb. 15-20.....Omaha, Neb., Show, Auditorium, C. G. Powell.
Feb. 15-20.....Bridgeport, Conn., Show, State Armory; B. B. Sterber.
Feb. 22.....San Francisco, Cal., Vanderbilt Cup Race, Panama-Pacific Exposition Grounds; Promoter, Panama-Pacific Exposition Co.
Feb. 23-27.....Ft. Dodge, Ia., Show, Armory, C. W. Tremain, Sec.
Feb. 23-27.....Syracuse, N. Y., Show, Syracuse Auto Dealers' Assn.; H. T. Gardner, Mgr.
Feb. 27.....San Francisco, Cal., Panama-Pacific Exposition, Grand Prize Race, Panama-Pacific Exposition Grounds; Promoter, Panama-Pacific Exposition Co.
Mar. 6-13.....Boston, Mass., Show, Mechanics Bldg., Boston Auto Dealers Assn., Boston Commercial Motor Veh Assn.
Mar. 9-15.....Des Moines, Ia., Show, C. G. Van Vliet.
Mar. 14.....San Francisco, Cal., Panama-Pacific Cup Race, Panama-Pacific Exposition Grounds; Promoter, Panama-Pacific Exposition Co.
April.....Calumet, Mich., Show, Coliseum.
May 17-18.....Boston, Mass., A. A. A. Annual Meeting.
May 29.....Indianapolis, Ind., 500-Mile Race, Indianapolis Motor Speedway.
June 9.....Galesburg, Ill., Two-mile Track Meet.
June 16.....Chicago, Ill., Speedway, 500-Mile Race, Speedway Park Assn.
June 25.....Sioux City, Ia., Track Meet.
July 4.....Tacoma, Wash., Road Race.
Aug. 20-21.....Elgin, Ill., Road Race.

The Week in the Industry

Motor Men in New Roles

STRAUSS Elected Chairman — M. B. Strauss, of St. Louis, was elected chairman of the St. Louis (Mo.) section of the Electric Vehicle Assn. of America, C. A. Michel having resigned.

Madden Overland's Assistant Treasurer—E. S. Madden, credit manager of the M. Rumely Co., Laporte, Ind., will become assistant treasurer of the Willys-Overland Automobile Co., Toledo, O., January 1.

Now with the Stutz—S. Hardy Mitchell, formerly with the Cadillac agency in Boston, has bought an interest in the Stutz Motor Car Co., Boston, Mass., and he has joined the salesforce as assistant manager.

James Hood Tire Sales Mgr.—The Hood Tire Co., of Watertown, Mass., has opened a St. Louis (Mo.) office. L. S. James, formerly of the James Tire Co., of St. Louis, has been appointed local sales manager and agent.

Pardee Chicago Studebaker Manager—F. J. Pardee has become manager of the commercial vehicle department of the Chicago, Ill., branch of the Studebaker Corp. He was formerly a Pacific Coast representative of the F. B. Stearns Co.

Campbell Elected Mayor—Chester I. Campbell, secretary of the Boston automobile organizations, and the manager of all the big automobile shows in the Hub, was elected Mayor of Quincy, Mass., at the election held in that city last week.

Lempe Heads Albany Club—Dr. George G. Lempe was re-elected president of the Albany Automobile Club, Albany, N. Y., at the annual meeting. The other officers are: Vice-president, Peter G. Ten Eyck; secretary-treasurer, Roland Ford; counsel, Melvin Bender.

Portland Assn. Elects Officers—At the annual meeting of the Portland Automobile Dealers' Assn. in Portland, Me., the following officers were elected: M. B. Mank, president; W. B. Thombs, vice-president; E. E. Brewer, treasurer, and H. B. Chandler, clerk.

McGuinness's New Appointment—F. V. McGuinness, sales engineer of the Edison Storage Battery Co., Orange, N. J., has been appointed assistant manager of the railway dept., taking the position of W. F. Bauer, who was recently made manager of the company's Chicago office.

Langtry Heads Ogden Agency—The Cadillac Sales & Service Co., Ogden, Utah, has been organized to take care of the Cadillac interests in Box Elder, Cache, Rich and Weber counties. Headquarters have been opened at Washington avenue and Twenty-sixth street. E. M. Langtry is in charge of the company.

Greenwald Rumor Incorrect—In THE AUTOMOBILE for November 26 it was stated in these columns that Lemon Greenwald, Ashland, O., had been made manager of a branch of the Firestone Tire & Rubber Co., Santiago, P. R. This statement was an error on the part of our correspondent, as Mr. Greenwald is manager of the service department of the Firestone company, a position he has held for a number of years.

Barnes Promoted—W. H. Barnes, Seattle, Wash., distributor for G. M. C. trucks, has been promoted to Pacific Coast district manager for the commercial vehicles of the General Motors Co. He will spend 6 months of each year in Seattle and an equal length of time in San Francisco. He also will have supervision of the G. M. C. wholesale branch in California. With the promotion of Mr. Barnes the factory has decided to open a Northwest distributing branch in Seattle. Mr. Barnes has represented the General Motors Co.'s product in Seattle since 1909.

Recent Klaxon Changes—W. H. Bendfelt, formerly of the Detroit office of the Western Electric Co., and P. C. Little, of Boston, late of the Bi-Motor Equipment Co., of that city, have been added to the Klaxon selling organization. W. G. Packard, of the Klaxon service department, and until recently in charge of Klaxon service in Detroit, has been transferred to the sales department. He will work in conjunction with R. G. Coghlan in the Eastern territory. F. M. Hayes, who, for the past 2 years, has represented the Klaxon sales department in New England, will henceforward use his experience and knowledge of this territory in perfecting and extending the Klaxon service system there.

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Garage and Dealers' Field

Plant Destroyed by Fire—Fire, November 12, destroyed the plant of the United Auto Co., Springfield, Mass. Loss, $20,000.

Lamp Branch Opened in Brooklyn—A Brooklyn, N. Y., branch of the Hudson Auto Lamp Works has been opened at 1054 Bedford avenue.

Detroit Gould Office Moved—The Gould Storage Battery Co., Detroit, Mich., has moved its office there in the Kerr Bldg., 100 Beaubien street.

Auto Surplus Moves—The Auto Surplus Stock Syndicate, 875 Eighth avenue, New York City, will be located after December 31 at Broadway and Fifty-second street.

Muskegon Vulcanizing Moves—The Muskegon Vulcanizing Co., Muskegon, Mich., has taken new quarters on Terrace street, and the latest in equipment will be installed in the plant.

Transforms Ambulances into Taxicabs—All the undertakers have disposed of their ambulances to the Ann Arbor Taxicab Co., Ann Arbor, Mich., which will transform them into automobile apparatus and operate them. They will be placed in service as soon as possible.

D'Arcy Spring in New Plant—The D'Arcy Spring Co., Kalamazoo, Mich., which manufactures springs for automobile seats, is occupying its new two-story, 200 by 300 feet, factory, and the finishing touches will be put on the plant before spring. The new factory of the company cost $50,000.

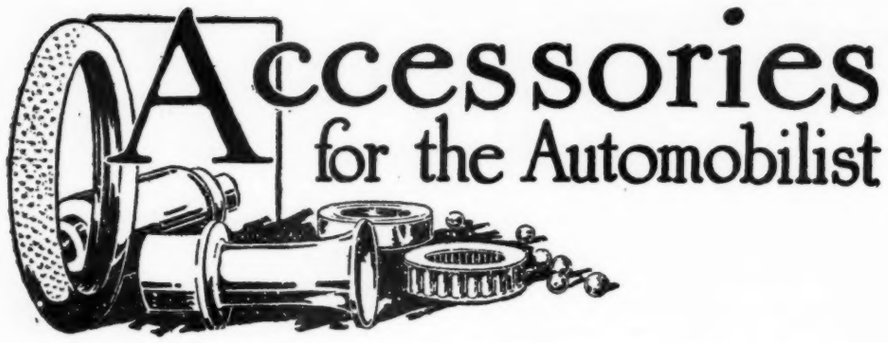
Ford Makes Improvements in Memphis—A permit for the construction of elevator inclosures in the new building of the Ford Motor Car Co., Memphis, Tenn., has been granted. The cost is given at $3,000, and, it is said, will bring the total amount of recent improvements to the building to more than $10,000.

Sparks-Withington's Display Board—The Sparks-Withington Co., Jackson, Mich., is supplying its dealers with a new demonstrating display board, which carries three hand-operated Spartan horns. The board is constructed of quartered oak, finished in the early English style, and carries the names and prices in plain view of the three models displayed. These are the Model EB, finished in black with nickel-plated front section of bell; Model F, in black satin finish, and Model M, with black satin body and interior of the bell nickel-plated.

Detroit Agent Builds Garage—A two-story showroom, office and garage will be erected at 694 Woodward avenue, Detroit, Mich., for the McKenney-Devlin Co., distributor for the Detroiter, Haynes and Grant cars. The showroom will be 50 feet square and two stories high, and fitted interiorly like a Dutch house. It will have a red tile floor and a large brick fireplace in the rear wall. Heavy oak beaming extending from the floor to the ceiling the full two stories in height and across the ceiling will be a feature. The garage will be 50 by 100 feet in dimensions. The service station at 22 Alexandrian street will be continued.

New Scheme for Automobile Sales—A new departure in the automobile world, which is interesting alike to dealers and buyers, has been inaugurated by C. E. Herrick, Inc., San Francisco. This firm will specialize in making cash purchases of medium-priced machines for buyers who desire to pay down a smaller sum than the ordinary dealer would be able to accept and to complete their purchase in reasonable monthly instalments. "Our plan will enable the dealer to make cash sales of cars that he would otherwise be obliged to sell on the instalment plan," said C. E. Herrick, "and it will enable many prospective buyers to obtain cars on terms which the dealer would be unable to offer them."

New Indianapolis Agencies—Several new agencies have been opened in Indianapolis. The Alter Motor Sales Co., distributor for the Alter, has moved its headquarters from Marion, Ind., to Indianapolis. A branch will be maintained at Marion. An agency for tubes and tires manufactured by the Hood Rubber Co., Watertown, Mass., has been opened at 514 North Capitol avenue by Clem T. Strauss. The Hampton Mfg. Co., manufacturer of Kant-Blo interliners, has established a sales agency at 429 North Meridian street, with W. F. Winslow as manager. The company will vulcanize free all tires and tubes blown out or punctured that are equipped with the interliners.



NO-SHAMMY Utility Box—A box for storing substances which need protection from air and dirt is made by the No-Shammy Products Co., Cleveland, O. The interior is divided into four parts, Fig. 1, three of which are round and one of which is rectangular. One compartment is intended for white lead, one for graphite and one for shellac. The large rectangular compartment is for grease.

In most garages these various articles are kept in the original containers and, although they may be used frequently, they are not always in good condition. The lead may be dry, the shellac thick and dirty and the graphite dry and flaky. The Utility box avoids all this. The box is made of heavy black japanned tin. The grease compartment is fitted with a self-closing cover, and the covers to the other compartments are furnished with hangers, so that they will not become lost.

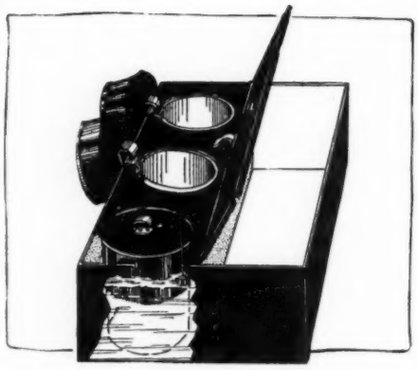


Fig 1—No-Shammy utility box

St. Louis Magnetizer—To recharge magneto magnets, the St. Louis Electric Works, 5409 Easton avenue, St. Louis, Mo., has put out the device shown in Fig. 2. It consists of a powerful electro magnet mounted on a neat wooden base, on which is a switch and two binding posts. A well-charged, 6-volt storage battery is connected to the binding posts, and the ends of the magneto are placed on the tops of the coils. The magnetizer weighs 8 pounds, measures 7 by 4.5 by 5.25 inches and sells for $7.50.

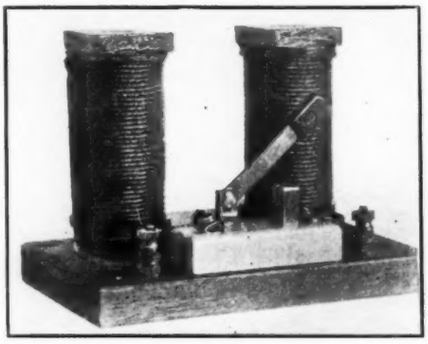


Fig 2—St. Louis Magnetizer

Ideal Electric Vaporizer—To provide easy starting in cold weather is the object of the new primer, Fig. 3, made by the Ideal Brass Works, Tenth and Canal streets, Indianapolis, Ind. There is an electrically-heated plug which is placed in the manifold and through which gasoline is discharged. Since the end of the plug is warm the fuel is heated and vaporizes easily, thus giving a good mixture and insuring a quick start. Current is supplied by four dry cells and the gasoline is supplied from a small gravity primer mounted on the dashboard. The device retails for $5 ready for installation, less batteries.

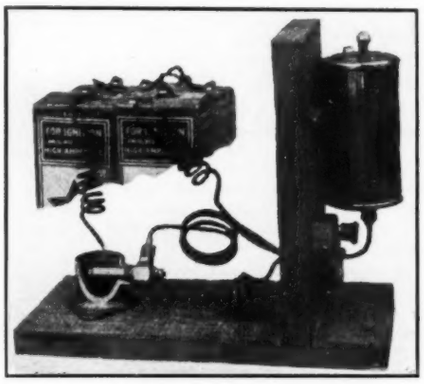


Fig. 3—Ideal Electric vaporizer

Jaeger Nitro Electric Lamps—Nitrogen-filled electric light bulbs which, it is said, give a white, intense light with a consumption of .5 watt per candlepower are made by H. J. Jaeger Co., Hoboken, N. J. A bulb is shown in Fig. 4.

The filament is made of drawn tungsten wire coiled into a helix and mounted within a very small space, thus concentrating the light and permitting close focal adjustment. Instead of operating this filament within a vacuum as is the case with the ordinary tungsten bulb it is surrounded by nitrogen and other inert gases under pressure, the presence of which permits a higher incandescence of the filament without disintegrating it, thus producing higher candle power and twice the efficiency of the ordinary type, it is stated.

There are two standard types, the G 16, 24 and 32 candlepower and the G 12, 15 to 21 candlepower. Both these lamps are for focusing and are made for voltages ranging from 6 to 14.

Davis Gas Lighter—An acetylene gas lighter has been put on the market by Hermann Dinkelaker, 7 N. Alabama street, Indianapolis, Ind. All that is required to light the lights is to turn a handle and press a button. In the city the lights may be dimmed by operating the same handle. The price is $5.

Presto Electric Hand Lamp—A simple lamp attachment which bolts to the top of a dry cell and which sells for $1.25 with battery has been brought out by the Metal Specialties Mfg. Co., 736 Monroe street, Chicago, Ill. As illustrated in Fig. 5, it consists of a bracket which may be attached to either the flush or extended carbon type of dry cell. The bracket is bolted to the carbon binding post and a wire runs to the zinc. There is a suitable handle for carrying the lamp by. The lamp itself is pivoted so that it may be set at any angle, thus providing most effective illumination.

Fisher Rim Grip Sub-Casing—The Western Auto Sub-Casing Co. Inc. of 1044 So. Los Angeles St., Los Angeles, Cal., is making the Fisher Rim Grip Sub-Casing, which is a casing used under the regular tire. The Sub-Casing is made of the same rubber impregnated fabric or friction as is used in all pneumatic tire construction. Varying numbers of layers of fabric depending on the size of the tire are built up and vulcanized together without any loose ends or overlapping splices.

Then two flexible flat steel bands are vulcanized into the Sub-Casing, one on each edge. These bands form the anchor or security for the reinforcement. Inflation of the inner tube forces these bands against the tire beads effectually preventing any slipping of the Sub-Casing which would be injurious to both tire and inner tube. These bands might be compared to the hoops on a barrel and the manner in which they hold the staves in place.

The Fisher Sub-Casing, it is claimed, is so strong and the basic principle is so practical that it holds all the inflation pressure strains put on it by the inner tube.

When used in tires that have unbroken fabric walls the makers guarantee against blow-outs, rim-cuts and other tire expense.

Pillsbury Wautopail—The Pillsbury Mfg. Co., Minneapolis, Minn., is manufacturing a water pail made of canvas and which can be folded and placed under one of the car seats. The fact that it can be flattened out makes this accessory valuable for those who do considerable touring. The Wautopail weighs but 8 ounces.

Fisk Red Top Ford Tire—The Fisk

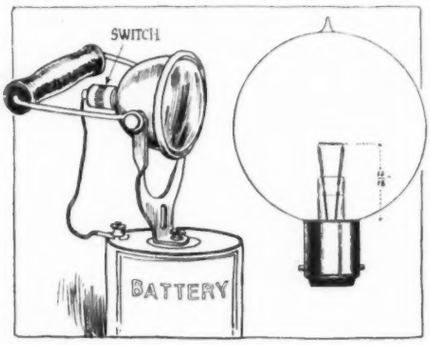


Fig. 4—Right—Jaeger Nitro Electric head lamps
Fig. 5—Left—Presto electric hand lamp

Nobody Home

What's the matter with the starter anyhow?

Nothing, your battery is frozen to death, that's all. Take it out, give it a decent burial and put in a Willard.

Then you can stay in the front seat, push the button and let her buzz! She'll turn that old engine over so fast it will make your head swim.

Somebody Home

There's always somebody home in the Willard Shops. Somebody inspecting every grid; somebody rejecting those "good-enough-for-some-folks" oxides that fall below Willard standard; somebody watching every man, machine and operation. It's all these little things put together that mean good hot service in cold weather.

ANSWER—Willard on the job in 85% of all electrically equipped cars.

Willard STORAGE BATTERY

Willard Storage Battery Company

CLEVELAND, OHIO

New York Branch: 228-230 W. 58th St.
Chicago Branch: 2524-30 S. Wabash Ave.
Detroit Branch: 736-740 Woodward Ave.
San Francisco Branch: 821 Monadnock Bldg.
Indianapolis Branch: 318 North Illinois St.

Service Stations in All Principal Cities in the United States, Canada and Mexico

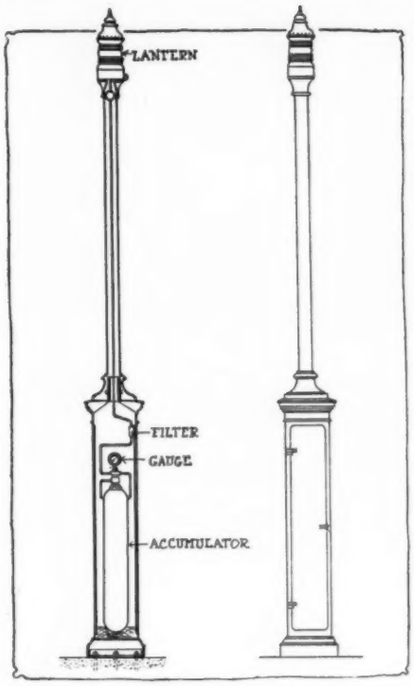


Fig. 6—A. G. A. highway beacon

Rubber Co., Chicopee Falls, Mass., is making a non-skid tire with a red top and white side walls for Ford cars. The tread has additional thickness and will therefore give greater life, it is stated.

A. G. A. Highway Beacon — A safety device, Fig. 6, to prevent accidents at night at dangerous turns, cross roads or railroad crossings, has been brought out by the American Gas Accumulative Co., Penn Building, Philadelphia, Pa., which has recently placed on the market a safety device known as the A. G. A. Highway Beacon, which is equipped with an automatic flash light giving from 30 to 90 flashes per minute, as desired.

It is evident that by using a flash light this danger signal cannot possibly be mistaken for an ordinary street light.

The illuminant used is dissolved acetylene, the brilliant white light of which makes it eminently suitable for a night signal. The acetylene is stored under pressure in seamless steel containers known as gas accumulators, which are made in various sizes from 2 1-2 to 1000 cubic feet capacity. These accumulators are filled with a mass of about 80 per cent. porosity. This mass is saturated with acetone, a liquid possessing the property of dissolving 250 times its own volume of acetylene at a pressure of 10 atmospheres.

As the accumulators are filled with a quantity of acetone equal to 40 per cent. of their own volume it follows that these containers will store 100 times their own volume of acetylene when charged to a pressure of 10 atmospheres.

The gas consumption is very small, approximately 0.8 cubic feet per 24 hours, and the light will burn for a period of from 60 to 200 days on one charging, depending on the size of tank.

Fig. 7 illustrates a highway beacon, recently installed in Potomac Park, Washington, D. C., which is equipped with a tank that will keep the light burning for 100 days at a total cost of $1.35.

Westinghouse Motor-Generator Battery Charger—The small motor-generator set, Fig. 8, forms a convenient, economical and reliable means for charging automobile starting, lighting and ignition storage batteries.

Fig. 7—A. G. A. highway beacon

It consists of an alternating-current motor and a direct-current generator compactly mounted in the same frame. The motor operates from the 60 cycle, 110 volt alternating current lighting circuit and drives the generator which furnishes the current for battery charging.

The generator is rated at 10 amperes and it can charge one or two 6-volt batteries or one 12-volt battery. Its voltage can be regulated from 6.3 volts to 12.6 volts by means of a field rheostat.

The operation is very simple. Merely connect the motor lead to the electric light socket and turn the snap switch. Adjust the generator to the desired voltage and connect with the battery. No attention or voltage regulation is required during charging. The generator is so wound that its voltage rises automatically at the end of the charge so that each cell receives 25 volts.

The length is 19 inches, width 7.75 inches, height 8.375 inches. Shipping weight 140 lbs.

The set is manufactured by the Westinghouse Electric Mfg. Co., East Pittsburgh, Pa.

Detroit Universal Coupling—The ball bearing universal which was briefly described in the October 29 issue of The Automobile is now being manufactured. The universal Products Co., 518 Woodbridge street, East Detroit, Mich., is the maker. The universal is shown in Fig. 9.

The features claimed for this universal are its frictionless action, perfect lubrication, capacity for frictionless longitudinal movement and its adaptability to tubular shaft drive construction which is now becoming so common.

It is stated that it is not only lighter than the usual type of universal but much smaller in diameter, contains less than half the amount of parts and is much stronger in proportion to its weight on account of its pressed steel body construction which eliminates the need for an outer housing.

The operation of the joint is clearly shown in the figure where it and it will be noted that the stress is taken by two hardened steel balls ground to very close limits and traveling in longitudinal races of circular section. These races are also hardened and ground to the proper limits of clearance to allow perfect rolling of the balls. The balls themselves are mounted on a hardened and ground nickel-steel trunnion pin which in turn is mounted through a third ball attached to the end of the drive shaft.

The universal action is obtained by the rotation and sliding of the ball members on the trunnion pin about the center of the spherical drive shaft head as a pivot. Moving the drive shaft up and down will cause the balls to roll in the races in opposite directions about the center while moving the drive shaft at right angles to this former movement the pivotal action is that of pivoting the trunnion pin through the balls themselves. The movement is limited by the conical, flat compensating spring at each end of the shaft, the shaft floating between these two springs.

Peerless Radiator—Hot water heaters which may be placed in the car floor in both the front and rear and which take their water supply from the radiator are made by the Peerless Radiator Co., Gibbs, Ida. Six tube heaters sell for $35, eight tube ones for $40. The connections to the water system are made near the radiator and do not interfere with cooling.

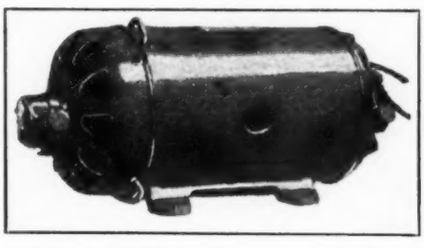


Fig. 8—Westinghouse motor-generator

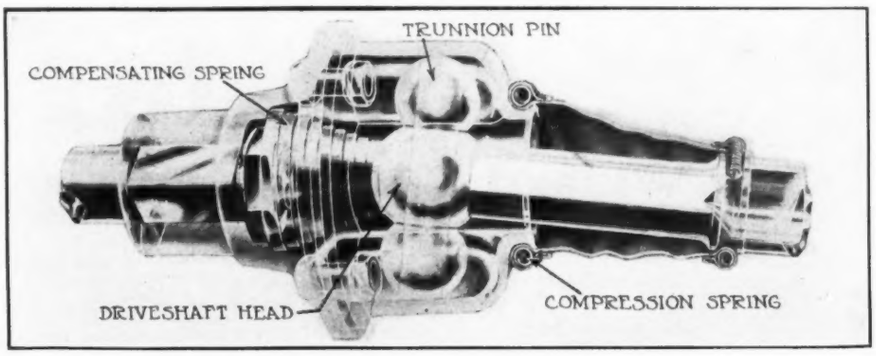


Fig. 9—Detroit universal coupling